REPORT RESUMES

ED 010 543 64

EDUCATIONAL COMMUNICATIONS SYSTEM--PHASE III.

BY- WITHERSPOON, JOHN P. AND OTHERS

NATIONAL ASSN. OF EDUCATIONAL BROADCASTERS

REPORT NUMBER NDEA-VIIB-450-A PUB DATE OCT 66
REPORT NUMBER BR-5-0995
CONTRACT OEC-5-16-014
EDRS PRICE MF-$0.45 HC-$12.20 305P.

DESCRIPTORS- *COMMUNICATIONS, *HIGHER EDUCATION, INFORMATION DISSEMINATION, SYSTEMS DEVELOPMENT, *MODELS, *INTERSCHOOL COMMUNICATION, *INFORMATION SYSTEMS, DEMONSTRATION PROGRAMS, ELECTRONIC EQUIPMENT, COOPERATIVE PROGRAMS, EDUCATIONAL RESOURCES, DISTRICT OF COLUMBIA

MULTIPURPOSE COMMUNICATIONS SYSTEM MODELS WERE DEVELOPED FOR APPLICATION TO HIGHER EDUCATION. THREE MODEL SYSTEMS - INTRASTATE, INTERSTATE, AND EDUCATIONAL RESOURCES - WERE DESIGNED. THESE SYSTEM DESIGNS WERE ESTABLISHED FOR EASY EVALUATION AND MAXIMUM FLEXIBILITY, WITH A MINIMUM OF PRESET AUTOMATIC EQUIPMENT. TWO ALTERNATIVE TRANSMISSION SYSTEMS WERE PRESENTED--(1) ONE BASED ON THE TELPAK TARIFF OF TELEPHONE COMPANIES, PROVIDING A NARROW-BAND SERVICE, AND (2) ONE BASED ON MULTIPURPOSE BROADBAND MICROWAVE TRANSMISSION. PLANS FOR EXPERIMENTAL OPERATION AND EVALUATION OF THE THREE MODELS IN A FOLLOWUP PHASE WERE INDICATED. RELATED INFORMATION MAY BE FOUND IN ED 003 165. (RS)

ED010543

B-450a
5-0995

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Office of Education
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FINAL REPORT
Project No. 450A
Contract No. OE-5-16-014

EDUCATIONAL COMMUNICATIONS SYSTEM: PHASE III

October 1966

U.S. DEPARTMENT OF
HEALTH, EDUCATION, AND WELFARE

Office of Education
Bureau of Research

EDUCATIONAL COMMUNICATIONS SYSTEM: PHASE III

Project No. 450A
Contract No. OE-5-16-014

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October 1966

The research reported herein was performed pursuant to a contract with the Office of Education, U.S. Department of Health, Education, and Welfare. Contractors undertaking such projects under Government sponsorship are encouraged to express freely their professional judgement in the conduct of the project. Points of view or opinions stated do not, therefore, necessarily represent official Office of Education position or policy.

National Association of Educational Broadcasters

Washington, D. C.

CONTENTS

INTRODUCTION 1

METHOD 2

RESULTS 7

DISCUSSION 10

  Interstate (Midwest) Model 11
    Engineering Designs 119

  Intrastate (Oregon) Model 172
    Engineering Designs 189

  Educational Resources Model 217
    Engineering Designs 226

  National Organization 248

  Negotiations with Telephone Companies 252

  Evaluation 255

CONCLUSIONS, IMPLICATIONS, AND RECOMMENDATIONS 260

SUMMARY 263

REFERENCES 265

APPENDIXES 266

INTRODUCTION

The Educational Communications System project is a four-phase need and feasibility study to examine the establishment of a network of multi-purpose electronic interconnections for American colleges and universities. The four phases are:

I. A brief examination of the state of institutional cooperation and interconnection.

II. A personal-interview survey of approximately fifty colleges and universities throughout the country, in order to learn the views of administrators and faculty members concerning the need for electronic interconnection.

III. The design of three model systems that would test some of the ideas derived from Phase II and examine more closely the communication requirements of academic institutions in selected areas.

IV. Experimental operation of Phase III models.

Phases I and II were completed in March, 1965. This is the final report of Phase III, the design of three model systems.

The Educational Communications System is part of a growing complex of interconnection studies, plans, and operating systems. Interconnected educational television networks great and small are operating or are in advanced planning stages in approximately twenty states at this writing. Under the impetus of such developments as Project MAC and INTREX at MIT, time-sharing computer techniques demonstrate the wisdom of interconnections for computer use. Projects such as MEDLARS at the National Library of Medicine obviously tend toward interconnection.

Within this complex, the peculiar value of the Educational Communications System is its orientation. We have carefully involved large numbers of faculty members and administrators, in order that ECS could have at its core the principle that we begin by attacking presently perceived problems with presently available technology. Our major technical premise was that more, and increasingly valuable, communication services might be feasible if transmission facilities were used on a multi-purpose basis, shared where necessary.

We have retained this orientation, and continue to consider it sound.

In addition, we realize that the technology, the administrative framework, the educational demands, and the users themselves will change over the next few years. Many of the uses proposed in the following pages may soon seem over-simple or even trivial, but they represent the evaluated ideas of the system's potential users, as those ideas were developed in 1966. Recognizing the evolutionary nature of the present situation, we have attempted to design systems in which growth can occur easily and in which use can be controlled, measured, and evaluated readily.

One area deserving considerable attention is the relationship of ECS to the other parts of the communication complex mentioned above. On the one hand, ECS is a finite study, emphasizing specific areas for a specific period of time. On the other hand, ECS is intended to provide information that will be useful to all of higher education. Other factors include the emergence of national information centers and systems, rapid technological change with attendant problems of technical standards, such innovations as the regional educational laboratories, and the fact that projects naturally affect each other even during their developmental stages.

METHOD

In order to accomplish the purposes of ECS, methods were devised to provide maximum involvement of potential users in the planning of the systems while providing technical and administrative expertise that considered likely long-range system development as well as these present-day requirements.

The fundamental tasks were to establish educational specifications which appear to reflect the needs of potential users and to translate these into technical and administrative designs which satisfy these specifications while taking future growth into account.

The methods varied somewhat from model to model in order to accommodate local professional relationships and administrative patterns, but liaison was provided through meetings of the project staff and the coordinating function of the project director. Specifics of method are included below in each model's discussion section, but an overview will be useful here.

The three Phase III models are as follows:

1. Inter-state, developing ECS for a variety of institutions in a major region of the United States. This model was devised with the Committee on Institutional Cooperation, which includes the Council of Ten and the University of Chicago. Members are University of Chicago, University of Illinois, Indiana University, University of Iowa, University of Michigan, Michigan State University, University of Minnesota, Northwestern University, Ohio State University, Purdue University, and University of Wisconsin. This model provides a community with a mixture of public and private institutions, most of them of major size, distributed over seven states, and with a wide variety of assets and educational needs.

2. Intra-State, developing ECS for a variety of institutions within one state. This model is being developed in cooperation with the Oregon State System of Higher Education, and involves all public institutions of higher education in the State of Oregon. These are organized under one administrative structure, but vary widely in size and emphasis.

3. Educational Resources, examining the feasibility of linking important non-academic and quasi-academic resources (research facilities, cultural and scientific institutions, libraries, and information centers) with institutions of higher learning in the other two models. This model is based in New York City and concentrates on resources of the Northeast, particularly those between Washington, D. C. and Boston.

After the model areas were determined and general orientation was set, field personnel were selected. They were:

1. Interstate (Midwest) Model : Associate Directors, James S. Miles and John H. Glade, both of Purdue.

2. Intrastate (Oregon) Model: Associate Director, Kenneth L. Warren, Division of Continuing Education, Oregon State System of Higher Education.

3. Educational Resources Model: Associate Director, Harold W. Roeth, previously Assistant Manager for Programming, Riverside Radio WRVR, New York.

To assist the staff in the development of Phase III, an Advisory Committee was named, composed of the following men:

Jack D. Summerfield, Chairman
General Manager, Riverside Radio WRVR
New York City

Bertram Berenson, AIA
Chairman, Department of Architecture
Hampton Institute, Virginia

Leslie P. Greenhill
Director, Division of Instructional Services
The Pennsylvania State University

Donald R. Larson
Assistant Chancellor
Oregon State System of Higher Education

Carl H. Menzer
Director of Broadcasting
University of Iowa

James G. Miller
Director, Mental Health Research Institute
University of Michigan

Philip Morse
Director, Computation Center
Massachusetts Institute of Technology

George E. Probst
Executive Director, Edison Foundation
Chairman, Broadcasting Foundation of America
New York City

Frank E. Schooley
Director of Broadcasting
University of Illinois

C. Walter Stone
Director of University Libraries
The University of Pittsburgh

Donald V. Taverner
President, Eastern Educational Network
General Manager, WQED-WQEX
Pittsburgh

Robert D. Tschirgi
Vice Chancellor
University of California, San Diego

Overview of Model Procedures

In the Interstate (Midwest) Model, each of the eleven CIC institutions appointed key administrators and faculty members to a campus ECS committee. Initially, these members represented 22 broad areas of academic, administrative, or "service" concern which were selected as representing substantial communication interest. In the course of their individual campus thinking about ECS, each institution was free to add or delete areas.

The Midwest ECS staff met with each of the eleven institutional ECS committees in carefully planned orientation sessions in order to acquaint them with the purposes and method of the project and to place emphasis on their key roles in the development of the educational specifications. These committees developed the initial list of potential ECS activities.

From these suggestions the staff prepared 262 individual proposals which were then sent to the institutional ECS committee members for evaluation. A total of 3161 proposal copies were mailed for evaluation, and the number of proposals received by any individual ranged from one to 25. Of the total number mailed, 1904 were returned.

Data obtained from these proposal evaluations were prepared for computer analysis. By appropriate coding of the proposal, the evaluator and the application, the questions and the responses, it was possible to analyze the proposals to determine the educational specifications.

Initial uses of the system, then, were proposed by potential users and evaluated by potential users.

After this investigation, technical and administrative designs were drawn by the staff with assistance from expert consultants and the ECS Advisory Committee.

The Intrastate (Oregon) Model used a somewhat less formal approach, although the results turned out to be similar. Following an orientation meeting attended by representatives of the Oregon institutions, the project director relied heavily on personal contact with professionals in many fields and with principal contact people on each campus. A relatively modest written survey confirmed the conclusions reached. Unique aspects of the Oregon model development were the strong involvement of other branches of state government and the close coordination with several statewide developmental projects. It will be seen that the Oregon ECS design includes terminals in the State Capitol and State Library as well as in the state's public academic institutions. It is likely that private institutions and elementary-secondary education ultimately be involved.

The Educational Resources Model is basically different from the others. In determining the model's educational specifications, it was first necessary to discover which resources had a possible early role in ECS. This was accomplished by applying four criteria to potential resources. The resource:

1. Must have "something"(usually information) that has been demonstrated as being needed by potential users.

2. Must have, or be developing, this information in a form that is easily and quickly disseminated.

3. Must be sympathetic to the concept of ECS and find it appropriate to cooperate in this sort of development.

4. Must obtain a significant reward or return in exchange for cooperation and participation.

Using these criteria, a list of potential resources was drawn, project proposals involving them were drafted, faculty members in the other models evaluated them. The responses, plus consultation with principals of the resources themselves, were used to determine the educational specifications for the Educational Resources Model. These conclusions also influenced the specifications devised for the other models.

As in the other areas, educational specifications were then translated into technical and administrative designs.

A specific comment is necessary concerning educational television. It will be seen in the discussion sections that rather little mention is made of ETV. This should not be interpreted as a lack of interest or a failure to take television into account. Early in the work of the ECS project, it was determined that non-television communication would be stressed for the following reasons: an overwhelming body of material on television already exists, including studies that deal directly with the areas under consideration here; and to a maximum extent we wished to concentrate on system uses that would apply in either of our two engineering configurations. Television requires a broadband (six megacycle) system, and we wished to preserve the option of a narrow-band (Telpak) system.

For those who wish to add a stronger television component to the present report, attention is invited particularly to the CIC Instructional Television Survey completed in September, 1965 (1), and to two Oregon studies: Inter-Institutional Teaching by Television in the Oregon State System of Higher Education, by Glenn Starlin and John E. Lallas (3), and a development committee report, A Study of Educational Television in Oregon (2), released in January 1965 and including a technical plan for statewide ETV development.

RESULTS

The purpose of ECS Phase III, as stated in the enabling contract, is "To develop three models of educational communications systems which will provide generalizable information about such factors as educational and technical specifications, administrative organization and costs."

The designs which are presented in detail in the discussion sections, then, are the central results.

Based on over two years of cooperative work with many individual professionals on twenty participating campuses, we have determined that the system's basic requirements are increased communication in various modes with professional counterparts on other campuses; easier administrative communication, both to ease coordination within university systems and to facilitate cooperative efforts among autonomous universities; maximum use of expensive computation and communications equipment; an interconnected broadcasting network; and, very importantly, wider cooperative use of library resources and information centers.

The engineering sections of this report provide a "two-layer" set of technical designs. There is a flexible, high capacity microwave system and there is a system based on a custom version of the telephone company's Telpak.

Telpak A service, the base on which we have developed this version of our design, provides twelve telephone channels, or a very large number of teletype circuits, or a broadband service of approximately 20 KC usable bandwidth, or various intermediate combinations. Basically, the proposed system consists of various Telpak combinations and a variety of terminal equipment, including facsimile, slow-scan television, telephone with such associated hardware as telelecture and electrowriting, high grade audio equipment for radio and other audio services of good quality, teletype to be used for conventional written communication and for computer access, etc.

The broadband microwave service would add two important dimensions: core-to-core computer transmissions and broadcast-quality television service. Such a system would also have greatly increased capacity to carry the less demanding kinds of services detailed in the previous paragraph. Choice of a microwave system over a Telpak-based system would approximately double the cost of the project.

The administrative arrangement of Phase IV would further develop the present scheme, which has proved very workable. In each case, cooperative arrangements would be worked out between NAEB as contractor and local agencies. Our firm intention is to provide all needed coordination while retaining a strongly local character on each campus. Ideally, the user of the future Educational Communications System would see ECS (if he thought of it at all) as a logical extension of present inter-campus services. The typical user's prime point of contact with ECS would be his desk telephone.

A modest staff would coordinate activities in each model, and ECS personnel on each campus would be trained in handling the equipment and operating the network. The national staff would provide intermodel coordination, broad consultation services, evaluation, national focus, project development activities, staff training, liaison with related groups, etc. At all levels, work directly on the communication requirements of actual users must be stressed.

A word should be said about what we have come to call the "core and satellite" approach to ECS development and funding. It seems likely that the establishment of the basic transmission system will not be enough to test the ECS concept. In order to operate the systems within a realistic project time span, we shall probably need to hasten the natural development of some dependent services. It has been proposed, for example, that we become involved in the establishment of a cooperative computer-based information system in the Midwest. Similarly, we will provide the possibility of high-quality radio networking, but presently we have no assurance that educational broadcasters can make maximum short-term use of this potential unless we become involved in the establishment of regional, network-oriented production centers. Since our major business is transmission rather than the development of content, and since these services (though of central importance) are all expensive, our approach is to treat the transmission system, along with its personnel and terminal hardware, as the basic unit. Into this core can be plugged a number of satellite sub-projects. This approach recognizes that it may be necessary for us to help the establishment of the satellites, but without the core all other questions are pointless.

It is the view of the project director that Phase IV should be of three years' duration: one year for equipment acquisition and installation, recruiting and training of staff, orientation of users, and establishment and testing of the interconnection system; followed by two years of trial operation. The operational period must be long enough to overcome novelty effects and to allow for "aha!" effects by users. Two years seems minimal.

In the course of this development, it will be necessary to identify and differentiate concerns which are primarily local, primarily regional, and primarily national. It is easy, though damaging, to attempt one general focus for the whole range of educational communications requirements.

At the same time, there is a strong need to maintain a national view on technical and operating standards, new developments such as satellite transmission, etc., lest a proliferation of individualized, incompatible systems make an electronic Babel within a very few years. Perhaps such agencies as the Joint Council on Educational Telecommunications can serve usefully here.

DISCUSSION

This section presents the specifics of the designs, cost information, and evaluation requirements. There is a separate subsection for each model, and at the end of each model's statement of method and educational requirements is a set of engineering designs which fulfill the requirements. At the end of this section is a statement on evaluation and additional comments concerning negotiations to date with common carriers.

EDUCATIONAL COMMUNICATIONS SYSTEM
INTERSTATE (MIDWEST) MODEL

James S. Miles
John H. Glade

INTERSTATE (MIDWEST) MODEL

INTRODUCTION

The association of major universities called the Committee on Institutional Cooperation, comprised of the Council of Ten and the University of Chicago, (see Appendix A for member institutions) has been an ideal testing ground for the ECS Midwest regional feasibility study. The purpose of the CIC is to provide the means for voluntary cooperative arrangements wherein the educational and research programs of the member institutions may be strengthened through pooling of resources and sharing of scarce or expensive facilities. The purpose of the Midwest study has been to design a model communications system which reflects felt needs for electronic interconnection as expressed by faculty members of CIC institutions.

In discussions with the ECS staff, administrative officers at the various member institutions of the CIC have underscored, as one of the severest challenges facing higher education, the sheer processing and management of new information which is being produced at fantastic rates on all campuses. At the outset, electronic interconnection was seen as a potential means to put information centers within easy reach of faculty members and of each other.

The general purposes of ECS were seen to be uniquely compatible with the CIC's traditional role of encouraging interinstitutional cooperation in the development of research projects, planning instructional programs, exchanging administrative information and creating an environment conducive to dialogues between the faculties.

METHOD

The ECS staff was committed from the beginning to the belief that educational specifications should shape the technical configuration of an electronic system of interconnection. The suggestions for system use and the evaluation of those suggestions by the faculty members who cooperated in the study were the central influence on the technical design described in this report.

In order to carry out the mission of the feasibility study, the following assumptions were made:

1. The study should be conducted within a set of disciplines and administrative areas which appeared to be logical choices for interconnection. These should be numerous and varied enough to give a broad cross-section, but few enough to be manageable in the study.

2. Faculty members on each campus should be designated to cooperate in the study where it concerned their specific areas of interest. The entire group of cooperating faculty members on all campuses would consist essentially of counterparts within the selected areas of interest.

3. A local Prime Contact would act as liaison between the ECS staff, the local faculty and the local CIC member.

4. Limitations of travel funds and time would require that the study be conducted essentially by mail.

The cooperation extended by the CIC solved many administrative problems facing ECS in its charge to design an interstate, multi-university model. At the same time, one of the strengths of the CIC is its dedication to the principle of voluntary association. The nature of its stated purposes assures that the individual member institutions shall determine whether, and the extent to which, they wish to participate in cooperative ventures. The agreement with the CIC, therefore, provided endorsement of the project and a means of approaching the separate campuses. However, since the CIC carefully preserves its "voluntary" policies, ECS relationships with the universities needed to be developed according to the administrative structures and procedures of the individual institutions.

In the cases of Ohio State, Wisconsin, and the University of Michigan, for example, it was decided by officials of those institutions that all communications regarding ECS should be channeled through the Prime Contacts, the person designated as the principal on the campus for ECS matters. In other words, the ECS office at Purdue did not send mail directly to nor receive it from faculty members on those campuses.

Some of the universities did not have full representation of the subject matter areas. Others added subject matter areas and assigned a number of individuals to many of these areas. There resulted, then, an imbalance from one university to the next as regards a matching of counterpart faculty members. The University of Chicago, for example, had eleven individuals in its ECS faculty group, while the University of Michigan initially listed sixty-eight.

Whereas all institutions cooperated in the study, some extended more administrative force and machinery for local follow-through than did others. This variation in procedures from institution to institution has had an effect on the total results of the study which would not have occurred if it had been possible to adhere to uniform procedures throughout.

Development of Procedures

Preliminary selection of subject matter areas. (Sept. 1-15, 1965)

The original selection of academic and administrative areas to be included in the study was made on the basis of information contained in the Phase II ECS study, the experiences of the CIC Instructional Television Committee, other CIC activities, and through counsel of the ECS Advisory Committee.

The initial list included the following:

ACADEMIC

1. Agricultural Extension
2. Architecture
3. Astronomy
4. Biology
5. Economics
6. Education
7. Engineering
8. Geology
9. Interdisciplinary Programs
10. Law
11. Medicine & Dentistry
12. Modern Languages
13. Psychology
14. Speech & Communications
15. Veterinary Medicine

ADMINISTRATIVE

1. Administration (President, Vice-President, etc.)
2. Admissions and Registrar
3. Business Offices
4. Broadcast Units
5. Computer & Data Processing Centers
6. Libraries

SPECIAL AREAS RELATED TO INDIVIDUAL CAMPUSES SUCH AS:

1. Aerospace Research Application Center
2. Thermophysical Properties Research Center
3. Argonne Laboratories

Refinement of procedures with CIC Representatives (Sept. 15 - Oct. 15, 1965)

A letter issued by Dr. Paul F. Chenea, Purdue's Vice-President for Academic Affairs and CIC Representative, to his counterparts at the other CIC institutions, paved the way for early involvement of faculty and staff on each campus. The letter served as an introduction of the ECS staff to CIC Representatives, asked for cooperation on the project, and suggested that the ECS staff would contact them for an appointment to discuss best ways to proceed with the study at their respective institutions.

Dates were then set with individual CIC members and visitations were made to the eleven institutions. At each such conference, the tentative list of areas was reviewed. In some cases, the suggested areas were approved as presented. In other cases, some areas were added or deleted or both.

The CIC Representative was asked to appoint a key faculty or administrative staff member in each area to represent that area for ECS on the local campus. The function of Prime Contact (liaison between the ECS Midwest office, the faculty and the campus CIC Representative) was also assigned to an individual staff member by the CIC Representative, and agreements were reached regarding methods of procedure the ECS staff would follow on each campus. In all cases, complete cooperation was extended by the members of the CIC. (See Appendix A for list of CIC Representatives and ECS Prime Contacts.)

It should be noted that by the conclusion of these visitations the list of academic and administrative areas to be included in the study was extended as follows:

ACADEMIC

1. Architecture
2. Astronomy
3. Athletics
4. Biology
5. Economics
6. Education
7. Engineering
8. Extension
9. Geography
10. Geology
11. Graduate School
12. Health Sciences
13. Interdisciplinary Programs
14. International Studies
15. Journalism
16. Languages
17. Law
18. Mathematics
19. Pharmacy
20. Psychology
21. Space & Scheduling
22. Speech & Communications
23. Veterinary Medicine
24. Chemistry
25. Music
26. Philosophy
27. Physics
28. Research

ADMINISTRATIVE

1. Administration
2. Admissions & Registrar
3. Broadcast Units
4. Business Offices
5. Computer & Data Processing Centers
6. Institutional Studies
7. Libraries & Audio-Visual Centers

SPECIAL AREAS

1. Aerospace Research Applications Center
2. Thermophysical Properties Research Center
3. CIC Ad Hoc Committee on Research and Development of Instructional Resources
4. CIC Economic Development Committee
5. CIC Biometeorology Graduate Program
6. Argonne Laboratories
7. Liberal Arts Deans
8. Iowa Testing Service

Orientation of Faculty Members (Oct. 15 - Dec. 15, 1965)

The ECS office developed brief documents (Appendixes B, C, D, E) for orientation purposes and distributed them to members of the various campus ECS faculty groups upon receipt of their names from each Prime Contact. At the same time the staff also developed a slide presentation which was to be used for the orientation sessions at each institution.

Dates for meetings were set with the respective campus groups as coordinated through the Prime Contacts and the CIC Representatives, and the second round of institutional visitations was begun. Involved were eleven institutions, 43 academic and administrative areas represented by a total of 371 faculty and administrative staff members.

The orientation sessions included the following points of information:

1. History of the concept of the Educational Communications System.
2. Basic purpose of an Educational Communications System.
3. Description and results of Phases I and II.
4. Purpose of Feasibility Study (Phase III).
5. Description and relationships of the three models of Phase III.
6. Concept of the technical system.
7. Some examples of system use.
8. Long range plans.
9. Detailed description of Phase III modus operandi.
10. Timetable.
11. Distribution of additional materials (Appendixes F, G, H, I)
12. Questions-Answers-Discussion

As explained to the local groups of faculty members, the success of the feasibility study hinged primarily upon the proper identification of the educational needs that might be met by an interinstitutional communication system. Specifically, committee members were asked to consult with colleagues in their areas of interest and forward to the ECS/CIC office at Purdue all ideas which might be applicable to the proposed communication system. In turn, these ideas would be converted into separate and distinct proposals for use and would be distributed to appropriate faculty members on all CIC campuses for evaluation. It was felt that specific ideas for the use of the communications system from carefully selected faculty members would provide a sound basis upon which to identify educational needs. The validity of those needs would be further tested through faculty evaluation.

Processing of mail activity. (Dec. 15 - April 15)

Through the four-month period of heaviest mail activity some 196 "ideas" or suggestions for system use were received from faculty members cooperating in the study. As expected, many suggestions were essentially duplications of others. By the same token many were judged to be applicable to more than one area of interest. The "ideas" received from faculty and administrative staff members have spawned some 262 individual proposals for use.

A total of 3161 proposal copies were mailed to faculty and staff members for evaluation. The number of proposals received by individuals ranged from one to 25 with all faculty members receiving an average of nine proposals. Of the total number of proposals mailed for evaluation, 1904 were returned: a return rate of 60 per cent.

As can be noted on the evaluation form, (Appendix I) faculty evaluators were asked to rate each proposal by responding on seven scales.

In addition, space was provided for comments. Question No. 8 asked: "Have you any comments on (or amendments to) the statement of the problem? If so, what are they?" Of the total 1904 evaluation forms which were returned, 468 or 25% of them included comments relative to question No. 8. Question No. 9 asked: "Have you any comments on (or amendments to) the statement of the proposed actions? If so, what are they?" Of the total 1904 evaluation forms which were returned, 572 or 30.0% of them included comments relative to question No. 9. Approximately 40% of all returned evaluation forms included some written comment. Aside from the instructive value of these comments, the fact that this many busy faculty and staff members took

PRECEDING PAGE MISSING

Yes or no: would communication occur regularly?
Duration of communication (15 minutes, ½ hour, etc.)
Number of institutions involved in communication
"Sender's role" (Professor as teacher, Professor as researcher, etc.)
"Receiver's role" (Professor as teacher, Professor as researcher, etc.)
One-way or two-way communication
Number of "senders"
Number of "receivers"
Abbreviated descriptor of subject area
Brief description of proposal use
Proposal originator's Identification number

Deck No. 3 ("Person" Deck)

Name of respondent
Area of Representation
Institution
Faculty respondent's Identification number

In the analyses of responses of faculty members who reviewed each proposal, most attention has been directed toward their responses to three of the questions on the evaluation form (Appendix I). These questions asked, essentially, whether the respondent or his associates found value in the service which the proposal described. For these questions as for others on the evaluation form, a five point scale was provided. Thus, by looking at responses to these questions, an estimate was obtained of the priority which might be assigned to the service in question. Proposals with higher magnitudes of priority were then examined with respect to their various characteristics, e.g., general purpose of the proposal, media suggested by the proposal, frequency of use suggested, number of institutions to be connected, etc.

The bulk of the available information within each proposal and each response to that proposal was represented within the three IBM card decks. Therefore, it has been possible to perform simple tallies and summaries of information of broad, general usefulness as well as to derive more specific analyses leading toward educational specifications for ECS.

RESULTS

The tables found on the following pages were derived from computer print-outs which processed and ordered information from the three IBM punched-card decks referred to under METHOD. Although several factors had to be considered in order to determine educational and technical specifications, the key element of analysis was the specific, isolated "proposal for ECS use." These proposals were made by faculty members who cooperated in the study. Each proposal was analyzed in terms of a number of questions vital to the design of the system. Each one contained information about how the system would be used, how many individuals and what discipline would be involved, what media (and bandwidth) would be required over what period of time, with what frequency, etc. The following tabulations deal with these factors and apply additional information concerning faculty evaluation of the proposals.

As noted under METHOD, sequential numbers were assigned in sets to various categories of input in order to codify and process information. Those faculty members named initially by CIC Representatives to assist with the study were assigned identification numbers ranging from "001" to "332". When colleagues of the faculty in this basic group either submitted proposals for use or responded to proposals with evaluations, they were assigned a set of numbers beginning with "600". Tables indicating the rate in which individuals received and returned proposals show that in most cases those with identification numbers of "600" or higher did not receive proposals but did, in fact, evaluate and return proposals to the ECS office. In most of these cases faculty members in the original group (and on the ECS mailing list for distribution) referred proposals to their colleagues for evaluation.

The tabulations reflecting faculty involvement were influenced also by the organization and composition of the separate campus groups. For example, most universities had a number of individuals listed in some academic and administrative areas covered by the study. At some universities all faculty members within a given discipline responded to proposals by returning evaluations. At others, only one faculty member returned evaluations although his colleagues had received all proposals. Although the ECS staff communicated directly with individuals on all campuses, it appears that groups within a given discipline at some of the universities operated as a rather informal committee with one of the number acting as "chairman" or prime respondent. Therefore, it can be noted that the "return rate" of proposal evaluations at these universities is somewhat lower.

The findings are presented in ten tables which follow. They are summarized and commented upon in the discussion section which follows Table X.

TABLE I

This table provides a broad overview of simple tallies and percentages as they relate to proposals for ECS use. Attention is called to items 3, 4, 8, 15 and 17 in this summary. These figures are affected by the fact that some disciplines were represented by only one respondent in a group of individuals who received proposals.

PROPOSALS FOR ECS USE:

A SUMMARY OF TALLIES AND PERCENTAGES

1.	Total No. of individual proposals	262
2.	Total No. of proposal copies distributed	3161
3.	Total No. of evaluation forms returned	1904
4.	Percent of return of all proposals	60%
5.	Range of distribution per proposal	1-34
6.	Range of return per proposal	0-25
7.	Total No. faculty members who received proposals	332
8.	No. of faculty members who responded to no proposals	83
9.	Most proposals received by an individual	25
10.	Most evaluations returned by an individual	25
11.	Fewest proposals received by an individual	1
12.	No. of Academic areas receiving proposals	34
13.	Academic area receiving most proposals: Biology	25
14.	Academic areas receiving fewest proposals: Journalism, Philosophy, Extensions, Schedules & Space	1
15.	Institution receiving most proposals: Michigan	848
16.	Institution receiving fewest proposals: University of Chicago	95
17.	Institution returning most evaluations: Michigan	329
18.	Institution with highest percentage of return: University of Chicago	84.2%
19.	Institution with lowest percentage of return: Michigan	38.8%

TABLE II

Rate of response from CIC Institutions

INSTITUTION & I.D. NO.	PROPOSALS SENT	EVALUATIONS RETURNED	PERCENT RETURNED
University of Chicago (01)	95	80	84.2
University of Illinois (02)	201	99	49.3
Indiana University (03)	349	200	57.3
University of Iowa (04)	347	184	53.0
University of Michigan (05)	848	329	38.8
Michigan State University (06)	263	134	50.9
University of Minnesota (07)	232	122	52.6
Northwestern University (08)	244	149	61.0
Ohio State University (09)	245	142	57.9
Purdue University (10)	241	176	73.0
University of Wisconsin (11)	312	190	60.9

TABLE III

Proposal Acceptance Based Upon Ratings of Seven Questions

The evaluation of any given proposal for ECS use depended first upon whether it was clearly understood by the faculty members who were asked to consider it. Questions "1" and "4" of each evaluation form asked these questions:

Question "1"	Is the problem understandably stated?
Question "4"	Are the proposed actions (i.e. the "remedies") understandably stated?

Respondents were asked to rate these questions on a five point scale ("0" = low, "4" = high). The mean ratings of questions"1" and "4" together can be summarized as follows for all proposals:

1. Lowest mean rating received by any proposal for questions "1" and "4" = 1.0
2. Highest mean rating received by any proposal for questions "1" and "4" = 4.0
3. Number of proposals with mean rating of 2.5 or higher for questions "1" and "4" = 234

The weight of the data would seem to indicate that the vast majority of proposals were written with sufficient clarity to be understood by faculty members.

Questions "2" and "3" on the evaluation form were concerned with the faculty's evaluation of the proposal as a problem.

Question "2"	To what extent do you feel personally concerned with the stated problem?
Question "3"	Among your campus colleagues, to what extent would the stated problem be a recognized concern?

The mean ratings of questions "2" and "3" together can be summarized as follows for all proposals:

1. Lowest mean rating received by any proposal for questions "2" and "3" together = .2 (Proposal 236)
2. Highest mean rating received by any proposal for questions "2" and "3" together = 3.7 (Proposals 111 and 192)
3. Number of proposals with mean rating from 0 - 1.0 = 11
4. Number of proposals with mean rating from 1.0 to 2.0 = 111
5. Number of proposals with mean rating from 2.0 to 3.0 = 123

6. Number of proposals with mean rating from 3.0 to 4.0 = 15

If it can be assumed that those proposals which received mean ratings of 2.0 or higher for questions "2" and "3" reflect faculty concern with the stated problem to a significant degree, then it would appear that 138 of the total of 262 proposals so identified would merit priority consideration in a pilot operation of the system.

Questions "5", "6", and "7" on the evaluation form were concerned with faculty evaluation of the action which was proposed to alleviate the stated problem.

Question "5"	To what extent will the proposed actions resolve the stated problem(s)?
Question "6"	To what extent would you personally wish to see the proposed actions undertaken?
Question "7"	Among your campus colleagues, to what extent would the proposed actions be supported or encouraged?

The mean ratings of questions "5", "6", and "7" together can be summarized as follows for all proposals:

1. Lowest mean rating received by any proposal for questions "5", "6", and "7" = .3 (Proposal #146)
2. Highest mean rating received by any proposal for questions "5", "6", and "7" = 4.0 (Proposal #198)
3. Number of proposals with mean rating from 0 to 1.0 = 12
4. Number of proposals with mean rating from 1.0 to 2.0 = 116
5. Number of proposals with mean rating from 2.0 to 3.0 = 116
6. Number of proposals with mean rating from 3.0 to 4.0 = 16

Again, if it can be assumed that those proposals which received mean ratings of 2.0 or higher for questions "5", "6", and "7" reflected significant desire for proposed action -- then it would appear that 132 of the total 262 proposals so identified would merit priority consideration in a pilot operation of the system.

TABLE IV

This table provides detail about each proposal for ECS use. The tabulation is oriented by academic or administrative area. The first column indicates the area of interest to which proposals were directed as well as the number of CIC institutions which had representation in those areas as far as the ECS study is concerned. The second column indicates only the I.D. numbers assigned to every proposal. The third column contains very brief descriptions of proposals. The fourth column indicates the number of proposal copies which were mailed to faculty members for evaluation and the fifth column indicates the number of evaluation forms which were returned by faculty.

The notation "ND" found in this and subsequent tables indicates "no data" was computed.

The forms used by faculty members to evaluate proposals included nine questions for answer. Reactions to the first seven questions were to be rated on a five-point scale ("0" for low, "4" for high). The sixth column in Table III is concerned with the mean ratings of questions 5, 6, and 7 as they pertain to individual proposals.

Question 5: To what extent will the proposed actions resolve the stated problem(s)?
Question 6: To what extent would you personally wish to see the proposed actions undertaken?
Question 7: Among your campus colleagues to what extent would the proposed actions be supported or encouraged?

Descriptions of Proposals by Academic Area

ACADEMIC AREA	PROP NO.	DESCRIPTOR	PROP SENT	EVAL RET	MEAN OF 5, 6, 7
ARCHITECTURE	238	Common VTR lecture played locally, followed by Network audio discussion	2	2	2.8
(Institutions: 2)					
	150	Professor from another campus participates on Ph.D. Committee	2	2	2.8
	180	Environmental control courses taught from several campuses via ECS	2	2	3.0
ASTRONOMY	239	Common VTR lecture played locally, followed by Network audio discussion	7	2	1.1
(Institutions: 6)					
	064	Astronomy course taught via live TV	7	5	1.0
	005	Weekly colloquia among CIC Astronomers	7	4	1.5
	085	ECS thesis conference between student and distant Prof	7	5	1.7
	095	Research information exchange between faculty members	7	5	1.8
	113	Interviewing graduate students via ECS	7	5	1.3

ACADEMIC AREA	PROP NO.	DESCRIPTOR	PROP SENT	EVAL RET	MEAN OF 5, 6, 7
ASTRONOMY	151	Professor from another campus participates on Ph.D Committee	7	5	2.8
	186	Conferences planning joint operation of new telescope	7	3	2.7
	030	Telelecture of graduate course	7	5	3.3
	041	Colloquia for Astronomy staffs	7	5	1.7
	068	Specialists from other campuses telelecture Astronomy majors	7	5	1.7
	072	Guest professors telelecture undergrads	7	5	.8
ATHLETICS	187	Interinstitutional games played on local campuses	4	2	3.5
(Institutions: 4)					
	111	Department head conference calls	4	2	3.8
	192	Research seminars	4	2	3.8
BIOLOGY	025	Audio exchange of teacher-education research materials	11	6	.7
(Institutions: 11)	141	Faculty member confers with mentor of student seeking admission	11	6	1.7
	021	Teletype exchange of teacher-education research materials	11	6	1.4

ACADEMIC AREA	PROP NO.	DESCRIPTOR	PROP SENT	EVAL RET	MEAN OF 5, 6, 7
BIOLOGY (cont)	219	ECS link with National Museum in Washington	11	3	3.3
	171	Regional storage and retrieval system	11	5	3.6
	240	Common VTR lecture played locally, followed by Network audio discussion	11	3	1.1
	052	Live TV lectures to Biology students	11	6	2.1
	065	Live TV Biology course	11	6	1.2
	001	Teacher-Education specialists (Biology) confer	11	7	2.2
	104	Department Head conference calls	11	5	.8
	112	Division heads regular conference call	11	5	.8
	086	Thesis conference between student and Distant Prof	11	5	3.0
	096	ECS conference to exchange research information	11	5	2.0
	119	Graduate student interviews via ECS	11	5	2.8
	128	Consultation regarding design of Lab Equipment	11	5	2.9
	152	Professor from another campus participates on Ph.D Committee	11	4	2.4
	155	Graduate student convention via ECS	11	4	1.7

ACADEMIC AREA	PROP NO.	DESCRIPTOR	PROP SENT	EVAL RET	MEAN OF 5, 6, 7
BIOLOGY (cont)	031	Telelecture of Biology Graduate course	11	6	1.8
	042	Colloquia for Biology staff members	11	6	2.5
	058	Telelectures for Biology majors at all institutions	11	6	2.0
	069	Telelectures for Biology majors at local institution	11	6	1.5
	073	Special course given via telelecture for local institution	11	3	1.3
(Institutions: 11)	224	Cooperative development of CAI Program Centers	11	3	1.5
	231	Thermophysical Properties Research Center services	11	1	4.0
	201	CIC consortium for faculty recruitment	11	5	1.4
ECONOMICS	006	Guest lecturers via ECS telelecture	12	8	2.2
(Institutions: 11)	241	Common VTR lecture played locally, followed by Network discussion	12	6	1.8
	053	Live TV lectures to Economics students	12	8	2.8
	087	ECS thesis conference between student and distant Prof	12	9	2.0

ACADEMIC AREA	PROP NO.	DESCRIPTOR	PROP SENT	EVAL RET	MEAN OF 5, 6, 7
ECONOMICS (cont)	120	Interviewing graduate students via ECS	12	9	1.4
	032	Telelectures for Economics graduate course	12	8	1.8
	043	Colloquia for Economics faculty	12	8	2.6
	059	Telelectures for Economics majors	12	6	1.9
	209	Access to Financial Information Center in New York	12	8	2.3
EDUCATION	026	Audio exchange of Teacher-Education research materials	18	11	2.2
(Institutions: 11)	142	Faculty member confers with mentor of student seeking admission	18	9	1.8
	022	Teletype exchange of teacher-education research materials	18	10	2.3
	007	Guest lecturer for Education course	18	10	2.9
	242	Common VTR lecture played locally, followed by Network audio discussion	18	8	1.9
	002	Teacher-Education specialists confer	18	7	2.5
	105	Department Heads conference call	18	9	2.2

ACADEMIC AREA	PROP NO.	DESCRIPTOR	PROP SENT	EVAL RET	MEAN OF 5, 6, 7
EDUCATION (cont)	113	Division Heads conference call	18	8	2.1
(Institutions: 11)	088	ECS Thesis conference between student and distant Prof	18	9	2.1
	194	Research Seminar via ECS	18	9	2.8
	039	Telelecture of Education graduate course	18	10	2.2
	050	Colloquia for Education Department staff	18	8	2.7
	256	Telelectures from Education specialists on East Coast	18	9	3.1
	202	Consortia for faculty recruitment	18	8	1.9
ENGINEERING	143	Faculty member confers with mentor of student seeking admission	22	14	1.5
(Institutions: 9)	243	Common VTR lecture played locally by audio network discussion	22	8	1.8
	106	Department Head conference call	22	16	1.9
	114	Division Heads conference call	22	15	1.6
	083	Thesis Conference between student and distant Prof	22	15	2.2
	093	Distant Professor participates in oral exam via ECS	22	15	2.1

ACADEMIC AREA	PROP NO.	DESCRIPTOR	PROP SENT	EVAL RET	MEAN OF 5, 6, 7
ENGINEERING (cont) (Institutions: 9)	097	Conference to exchange research information	22	15	2.5
	121	Graduate student interviews via ECS	22	15	2.0
	129	Consultation via ECS on Lab equipment design	22	15	2.2
	156	Graduate student convention via ECS	22	14	1.6
	182	Graduate student seminars via ECS	22	13	1.8
	193	Research seminars via ECS	22	12	1.9
	033	Telelecture of Graduate Engineer course	22	13	2.2
	044	Colloquia for Engineering staffs	22	14	2.3
	225	Development of CAI Program Centers	22	9	2.1
	232	Thermophysical Properties Research Center services	22	9	2.3
	212	Access to Engineering Society Library Index via ECS	22	12	2.7
	203	Consortia for faculty Recruitment	22	12	1.1
EXTENSION (Institutions: 11)	174	Telelectures for continuing education conferences	14	9	2.7
GEOGRAPHY (Institutions: 5)	066	Geography course via live television	6	3	1.8

ACADEMIC AREA	PROP NO.	DESCRIPTOR	PROP SENT	EVAL RET	MEAN OF 5, 6, 7
GEOGRAPHY (cont) (Institutions: 5)	070	Telelectures for Geography majors at all institutions	6	3	2.4
	074	Telelectures for Geography majors at local institutions	6	3	1.9
GEOLOGY (Institutions: 11)	255	Regular transmission of weather maps from Washington	11	7	1.7
	164	Regional storage and retrieval system	11	10	2.8
	245	Common VTR lecture played locally followed by Network audio discussion	11	7	1.6
	054	Live TV lectures for Geology students	11	8	2.2
	067	Live TV Geology course	11	8	1.6
	190	Exchange of visual materials via facsimile	11	7	1.7
	195	Research Seminars via ECS	11	7	2.3
	060	Telelecture series for all institutions	11	8	1.8
	071	Guest telelecturers for local course	11	8	2.0
	075	Portion of local course taught by telelecture	11	8	1.1
GRADUATE SCHOOLS (Institutions: 5)	244	Common VTR lecture played locally followed by Network audio discussion	5	4	2.6

ACADEMIC AREA	PROP NO.	DESCRIPTOR	PROP SENT	EVAL RET	MEAN OF 5, 6, 7
GRADUATE SCHOOLS (cont) (Institutions: 5)	084	Thesis conference between student and distant Prof	5	5	2.2
	094	Distant Professor participates in oral exam via ECS	5	5	1.8
	098	Conference via ECS to exchange research information	5	5	2.6
	122	Interviews with graduate students via ECS	5	5	2.4
	153	Professor from another campus participates on Ph.D. Committee	5	5	2.0
	157	Graduate student convention via ECS	5	5	1.8
	184	Graduate student seminars	5	5	1.5
	034	Telelectures for Graduate students	5	5	2.6
	045	Colloquia for graduate school staff	5	5	2.8
	233	Thermophysical Properties Research Center services	5	4	2.5
HEALTH SCIENCES (Institutions: 10)	220	ECS link with National Museum in Washington	26	9	2.6
	246	Common VTR lecture played locally followed by live audio net discussion	26	8	2.3
	135	Guest lecturers via television	26	13	2.2
	191	Ophthalmic Pathology conferences	26	ND	ND

ACADEMIC AREA	PROP NO.	DESCRIPTOR	PROP SENT	EVAL RET	MEAN OF 5, 6, 7
HEALTH SCIENCES (cont) (Institutions: 10)	100	Conferences to exchange research information	26	13	2.3
	130	Consultation on Lab equipment design	26	12	1.9
	196	Research Seminars	26	11	2.6
	229	Physiology experts in sub-specialties confer	26	8	2.4
	015	Continuing education telelectures for physicians	26	12	2.0
	017	Continuing education telelectures for Nurses	26	14	1.8
	035	Telelectures for grad courses in Medicine	26	13	1.9
	046	Colloquia for Medical staffs	26	12	2.2
	136	Guest lecturer via telelecture	26	13	1.7
	230	Graduate course in Physiology via ECS	26	8	2.7
	234	Thermophysical Properties Research Center services	26	7	2.5
	215	Dental school faculties exchange information	26	10	2.2
	214	Regular seminars between dental schools	26	9	1.8
INTERDISCIPLINARY STUDIES (Institutions: 6)	077	Special live TV course	10	10	1.9
	101	Conference to exchange research information	10	7	1.8

ACADEMIC AREA	PROP NO.	DESCRIPTOR	PROP SENT	EVAL RET	MEAN OF 5,6,7
INTERDISCIPLINARY STUDIES (cont) (Institutions: 6)	131	Consultation on lab equipment design	10	7	1.3
	076	Course taught by telelecture	10	10	1.7
INTERNATIONAL STUDIES (Institutions: 4)	082	Staff Seminar with State Department officials via ECS	5	5	2.6
	257	ECS link with interuniversity consortium at University of Michigan	5	2	3.1
JOURNALISM (Institutions: 4)	012	Guest telelecturers for Journalism classes	4	4	2.5
LANGUAGES (Institutions: 11)	027	Exchange of Teacher-Education research	12	7	1.9
	144	Faculty member confers with mentor of student seeking admission	12	9	1.3
	213	Sharing of language lab resources	12	8	2.6
	023	Teletype exchange of teacher education research	12	8	1.6
	003	Teacher-Education specialists confer	12	9	1.9
	107	Department Heads conference call	12	8	2.5
	115	Division Heads conference call	12	10	2.2
	158	Graduate student convention via ECS	12	9	1.4

ACADEMIC AREA	PROP NO.	DESCRIPTOR	PROP SENT	EVAL RET	MEAN OF 5, 6, 7
LANGUAGES (cont) (Institutions: 11)	197	Research Seminar via ECS	12	8	1.8
	204	Consortia for faculty recruitment	12	8	2.3
LAW (Institutions: 8)	188	Development of and access to regional computerized law library	10	5	2.6
	008	Guest lecturer for law classes via telelecture	10	6	1.6
	247	Common VTR lecture played locally and followed by live audio net discussion	10	4	2.1
	089	Thesis conference via ECS between student and distant Professor	10	6	1.9
	102	ECS conference to exchange research information	10	6	2.1
	123	Interviews of graduate students via ECS	10	7	1.0
	014	Continuing education telelectures for practicing Lawyers	10	6	1.3
	036	Telelecture of graduate course	10	6	1.4
	047	Colloquia for Law School staff	10	6	1.5
	210	ECS link with Financial Information Center in New York	10	3	2.4

ACADEMIC AREA	PROP NO.	DESCRIPTOR	PROP SENT	EVAL RET	MEAN OF 5, 6, 7
MATHEMATICS (Institutions: 7)	028	Exchange of teacher-education research via ECS audio	7	5	1.4
	145	Faculty member confers with mentor of student seeking admission	7	5	.7
	019	Access to and slow scan TV display of Mathematics Abstracts on scheduled basis	7	5	1.7
	024	Teletype exchange of teacher education research materials	7	5	1.5
	020	Access to, and slow scan TV display of , Mathematics Abstracts on as needed basis	7	5	1.6
	165	Regional storage and retrieval center via ECS	7	5	2.3
	248	Common VTR lecture played locally, followed by live audio discussion on Net	7	4	2.2
	004	Teacher education specialists confer	7	5	1.9
	108	Department Heads conference call	7	4	1.6
	116	Division Heads conference call	7	5	1.5
	018	Monthly colloquium for mathematicians	7	5	2.4
	162	Conferences on cooperative research	7	5	1.8

ACADEMIC AREA	PROP NO.	DESCRIPTOR	PROP SENT	EVAL RET	MEAN OF 5, 6, 7
MATHEMATICS (cont) (Institutions: 7)	159	Graduate student conventions	7	5	1.4
	061	Telelectures for mathematics majors	7	5	1.3
	236	Thermophysical Properties Research Center services	7	4	1.1
	205	Consortium for faculty recruitment	7	4	.8
PHARMACY (Institutions: 3)	146	Faculty member confers with mentor of student seeking admission	3	3	.3
	166	Access to regional Storage and Retrieval system via ECS	3	3	2.6
	249	Common VTR lecture played locally followed by live audio discussion on net	3	3	2.1
	090	Thesis conference between student and Professor at distant campus	3	3	1.3
	124	Interviewing graduate students via ECS	3	3	1.4
	132	Consultation on lab equipment design	3	3	1.9
	154	Professor from another campus participates on Ph.D. Committee via ECS	3	3	1.0
	013	Continuing education telelectures for pharmacists	3	3	2.8

ACADEMIC AREA	PROP NO.	DESCRIPTOR	PROP SENT	EVAL RET	MEAN OF 5, 6, 7
PHARMACY (cont) (Institutions: 3)	038	Telelecture of a pharmacy course	3	3	1.7
	049	Colloquia for pharmacy staffs	3	3	2.9
	235	Thermophysical Properties Research Center services	3	2	2.1
	198	Rapid access to Chemical Abstracts via ECS	3	1	4.0
PSYCHOLOGY (Institutions: 10)	147	Faculty member confers with mentor of student seeking admission	10	ND	1.8
	010	Guest telelecturer for Psychology class	10	8	2.1
	250	Common VTR lecture played locally followed by live audio discussion on Net	10	6	1.6
	056	Live TV lectures for Psychology students	10	10	2.3
	109	Department head conference call	10	7	.8
	103	ECS conference to exchange research information	10	7	2.2
	125	Interviewing graduate students via ECS	10	6	1.8
	160	Convention for graduate students via ECS	10	7	1.5
	183	Seminars for graduate students via ECS	10	8	1.6

ACADEMIC AREA	PROP NO.	DESCRIPTOR	PROP SENT	EVAL RET	MEAN OF 5, 6, 7
PSYCHOLOGY (cont) (Institutions: 10)	037	Telelecture of graduate course	10	7	1.1
	048	Colloquia for psychology staff	10	7	2.7
	062	Telelectures for Psychology majors	10	7	2.3
	226	Development of and access to regional CAI Center	10	6	1.4
	206	Consortium for faculty recruitment	10	7	1.4
SCHEDULES & SPACE (Institutions: 3)	078	Regular business conferences	3	3	1.6
SPEECH & COMMUNICATIONS (Institutions: 10)	148	Faculty member consults with mentor of student seeking admission	10	9	1.8
	009	Guest telelecturer for speech class	10	9	2.2
	251	Common VTR lecture played locally followed by live audio discussion on net	10	8	1.7
	110	Department Head conference call	10	8	2.2
	117	Division Heads conference call	10	9	2.5
	185	Interscholastic debates via ECS	10	3	1.9
	040	Telelecture of speech graduate course	10	9	1.5

ACADEMIC AREA	PROP NO.	DESCRIPTOR	PROP SENT	EVAL RET	MEAN OF 5, 6, 7
SPEECH & COMMUNICATIONS (cont) (Institutions: 10)	051	Colloquia for speech faculties	10	9	2.8
	181	Graduate student seminars	10	8	2.1
	207	Consortium for faculty recruitment	10	9	1.6
VETERINARY SCIENCE (Institutions: 4)	167	Development of and access to regional storage and retrieval center	4	3	2.6
	252	Common VTR lecture played locally followed by live audio discussion on net	4	2	2.6
	091	Thesis conference between student and a professor at another institution	4	3	3.2
	099	ECS conference to exchange research information	4	3	3.1
	126	Interviews of graduate students via ECS	4	3	2.5
	133	Consultation on lab equipment design	4	3	2.8
	016	Continuing education telelectures for Veterinarians	4	4	3.1
	237	Thermophysical Properties Research Center services	4	2	1.0
MUSIC (Institutions: 2)	227	CIC music depts. confer on ECS to arrange activities	2	2	1.5
	216	Colloquia for music dept. faculty	2	2	3.5

ACADEMIC AREA	PROP NO.	DESCRIPTOR	PROP SENT	EVAL RET	MEAN OF 5, 6, 7
MUSIC (cont) (Institutions: 2)	217	Telelecture of special graduate music course	2	2	3.3
	228	CIC music depts. confer via live TV to arrange activities	2	2	3.8
CHEMISTRY (Institutions: 2)	168	Development of and access to regional storage and retrieval center	2	1	3.0
	199	Rapid access to Chemical Abstracts storage and retrieval center	2	2	2.6
PHILOSOPHY (Institutions: 1)	011	Guest telelecturer for philosphy class	1	1	3.0
PHYSICS (Institutions: 5)	169	Development of and access to regional storage and retrieval center	5	5	1.8
	057	Live TV lectures for physics majors	5	4	2.8
	063	Telelecture for physics majors	5	4	1.9
	200	Rapid access to project TIP via ECS	5	5	2.8
ADMINISTRATION (Institutions: 11)	139	Teletype exchange of financial information	13	13	2.4
	477	Live TV course in interdisciplinary area	13	7	2.0
	079	Audio conference between business staff members	13	9	2.7

ACADEMIC AREA	PROP NO.	DESCRIPTOR	PROP SENT	EVAL RET	MEAN OF 5, 6, 7
ADMINISTRATION (cont) (Institutions: 11)	137	Financial officers confer	13	12	2.5
	476	Course taught in interdisciplinary area via telelecture	13	7	2.0
	208	Consortium for faculty recruitment	13	9	1.4
ADMISSIONS & REGISTRAR (Institutions: 11)	149	Admissions officers confer with mentor of student seeking admission	13	10	2.2
	175	Facsimile exchange of transcripts	13	10	2.8
	577	Live TV course in interdisciplinary area	13	6	2.0
	080	Regular audio conference between admissions officers and between registrars	13	9	2.8
	092	Thesis conference between student and professor on another campus	13	9	2.6
	127	Interview of graduate students via ECS	13	9	2.4
	576	Course taught in interdisciplinary area via telelecture	13	7	2.0
BROADCAST UNITS (Institutions: 11)	029	Plan for CIC radio network	11	9	3.3
	253	Plan for network programming	11	9	ND
BUSINESS OFFICE (Institutions: 9)	140	Teletype exchange of financial information	9	8	1.7

ACADEMIC AREA	PROP NO.	DESCRIPTOR	PROP SENT	EVAL RET	MEAN OF 5, 6, 7
BUSINESS OFFICE (cont)	081	Audio conference between business staff members	9	7	1.5
(Institutions: 9)	138	Financial officers confer	9	7	1.6
COMPUTER & DATA PROCESSING (Institutions: 10)	170	Regional data storage & retrieval center	10	9	2.4
	173	Cooperative development of computer programs	10	9	2.2
	222	Development of CAI program center	10	8	1.8
	258	CIC schools tie to inter-university consortium at University of Michigan	10	7	2.0
INSTITUTIONAL STUDIES	218	Audio conference between staff members of CIC group	5	3	2.7
(Institutions: 4)	221	Development of CAI program center	5	3	2.3
LIBRARIES & AUDIO VISUAL (Institutions: 11)	161	Regular conference call between AV centers for film requests	34	22	2.0
	189	Teletype & slow scan TV access to Center for Research Libraries in Chicago	34	20	2.3
	172	Regional storage & retrieval center	34	20	2.0
	163	Facsimile service between libraries	34	10	2.5
	176	Interlibrary loan service using LDX via ECS	34	19	2.8

ACADEMIC AREA	PROP NO.	DESCRIPTOR	PROP SENT	EVAL RET	MEAN OF 5, 6, 7
LIBRARIES & AUDIO VISUAL (cont) (Institutions: 11)	134	Round robin surveys of CIC library operations via ECS	34	22	2.3
	177	Media research specialists confer via ECS	34	16	2.2
	178	Development of regional learning resource center	34	17	2.1
	179	Survey of CIC instructional media centers	34	16	2.4
	223	Development of CAI program centers	34	14	1.6
	211	ECS access to Financial Information Center in Manhattan	34	19	1.6
	254	Establishment of and access to interlibrary loan center for CIC in Washington	34	16	2.6

TABLE V

This table is keyed to the academic and administrative areas covered in the study. It identifies these areas, the institutions and faculty members to whom proposals were sent--by name and identification numbers. Tallies in the last three columns indicate the number of proposals each faculty member received, the number of evaluations he returned and the number of proposals he originated. In most cases faculty members with identification numbers of "600" or higher evaluated proposals referred to them by a colleague but were not, themselves, on the ECS mailing list. They, therefore, are not credited with having received proposals. Also to be noted are the tallies of institutions which had more than one representative in a given area. In some cases only one of their group returned evaluation forms although all members of the group received all proposals.

ACADEMIC AREA (ID NO.) INSTITUTION (ID NO.)	FACULTY MEMBER (ID NO.)	PROP SENT	EVAL RET	PROP ORIG
Architecture (01)				
Illinois (02)	Brightbill, Linwood 001	3	3	1
Minnesota (07)	Vivrett, Walter K. 002	3	3	0
Michigan (05)	Brownson 711	3	1	0
Astronomy (02)				
Indiana (03)	Edmundson, Frank 003	12	0	0
	Wrubel, Marshall 004	12	9	0
Iowa (04)	Van Allen, James 005	12	0	0
	Neff, J. 807	0	1	0
Michigan (05)	Mohler, Orren 006	12	12	0
Michigan State (06)	Osgood, Thomas 802	12	5	0
Northwestern (08)	Henize, Karl 007	12	11	1
Ohio State (09)	Slettebak, Arne 008	12	0	1
Wisconsin (11)	Code, Arthur 009	12	0	0

ACADEMIC AREA (ID NO.) INSTITUTION (ID NO.)	FACULTY MEMBER (ID NO.)	PROP SENT	EVAL RET	PROP ORIG
Athletics (03)				
Illinois (02)	Eliot, Ray 010	3	0	0
Michigan (05)	Schurr, Evelyn 011	3	3	0
Purdue (10)	France, Wellman 012	3	2	0
Wisconsin (11)	Mott, James 013	3	0	0
Biology (04)				
Iowa (04)	Hulbary, Robert 014	25	12	0
Michigan (05)	Allen, John 015	25	0	4
	Elliott, Alfred 016	25	20	0
	Mite, James E. 017	25	0	0
	Nace, George 018	25	25	2
Michigan State (06)	Byerrum, Richard 019	25	0	0
Minnesota (07)	Skjegstad, Kenneth 020	25	24	0
Northwestern (08)	Wolfson, Albert 021	25	0	0
Ohio State (09)	Wharton, George 022	25	24	0
Purdue (10)	Harrison, Forrest 023	25	1	0
Wisconsin (11)	Bucklin, Donald 024	25	17	0
Economics (05)				
Chicago (01)	Ashenhurst, Robert 025	9	9	0
Illinois (02)	Paden, Donald 026	9	8	0
Indiana (03)	Braden, S.E. 027	9	0	0
	Williams, Edgar 028	9	1	0
	Pauscher, W. 801	0	8	0
Iowa (04)	Morgan, Chester 029	9	0	0
Michigan (05)	Krachenberg, A.R. 030	9	8	0
	Palm, Thomas 031	9	0	0
	Frisfeld 809	0	8	0
Michigan State (06)	Lanzillotti, Robert 032	9	2	0
Minnesota (07)	Turnbull, John G. 033	9	9	0

ACADEMIC AREA (ID NO.) INSTITUTION (ID NO.)	FACULTY MEMBER (ID NO.)	PROP SENT	EVAL RET	PROP ORIG
Economics (05)				
Northwestern (08)	Eisner, Robert 034	9	0	0
Purdue (10)	Day, John 035	9	9	0
Wisconsin (11)	Johnson, David B. 036	9	8	0
Education (06)				
Chicago (01)	Griffith, Wm. S. 037	14	13	0
Illinois (02)	Slater, Marlowe 038	14	4	1
Indiana (03)	Fattu, N.A. 039	14	11	0
	McQuigg, R. Bruce 040	14	0	0
	Peak, Phillip 041	14	14	0
Iowa (04)	Marker, Robert 042	14	0	0
	Jones, Howard 043	14	0	0
Michigan (05)	Benjamin, Richard 044	14	10	0
	Montoye, Henry 045	14	1	0
Michigan State (06)	Ivey, John E. 046	14	1	0
	Ward, Ted 047	14	0	0
Minnesota (07)	Neale, Daniel C. 048	14	0	0
Northwestern (08)	Maidment, Robert 049	14	14	0
	Usdan, Michael 050	14	6	0
Ohio State (09)	Holsinger G. Robert 051	14	10	0
	Cyphert, Frederick R. 052	14	14	1
Purdue (10)	Hicks, Charles 053	14	12	0
Wisconsin (11)	Thiede, Wilson B. 054	14	11	0
Engineering (07)				
Illinois (02)	Wetenkamp, Harry 055	18	17	0
Iowa (04)	Hubbard, Phillip 056	18	ND	ND
	Epley, Donald 057	18	18	0

ACADEMIC AREA (ID NO.) INSTITUTION (ID NO.)	FACULTY MEMBER (ID NO.)	PROP SENT	EVAL RET	PROP ORIG
Engineering (07) cont.				
Michigan (05)	Becher, William D. 058	18	0	0
	Morrison, Richard B. 059	18	0	0
	Ristenbatt, M.P. 060	18	16	0
	Sawyer, T.M. 061	18	0	0
	Welch, Harold J. 062	18	0	0
	Wilson, Dean 063	18	13	0
	Wolf, Louis W. 064	18	18	0
	York, J.L. 065	18	0	0
Michigan State (06)	Hoffman, John W. 066	18	15	0
	Von Tersch, Lawrence W. 067	18	18	0
Minnesota (07)	Blatherwick, Allan A. 068	18	15	0
Northwestern (08)	Hillard, John 069	18	18	7
	Rath, Gustav J. 070	18	18	0
Ohio State (09)	Bolz, Harold A. 071	18	0	0
Purdue (10)	Solberg, Harry 072	12	10	0
	Hayt, William 707	6	6	0
Wisconsin (11)	Marshall, W. Robert 073	18	13	0
	Skiles, James 074	18	10	0
	Wendt, Kurt F. 075	18	15	0
	Zweifel, Leroy G. 076	18	0	0
Extension (08)				
Illinois (02)	Behrens, John 077	1	0	0
	Carter, Gerald C. 078	1	1	0
	Read, Hadley 079	1	1	0

ACADEMIC AREA (ID NO.) INSTITUTION (ID NO.)	FACULTY MEMBER (ID. NO.)	PROP SENT	EVAL RET	PROP ORIG
Extension (08) cont.				
Indiana (03)	Reiberg, Rufus 080	1	0	0
	Higgins, Smith 081	1	0	0
Iowa (04)	Fay, Robert F. 082	1	1	0
Michigan State (06)	Doyle, Louis A. 083	1	1	1
	McIntyre 084	1	0	0
Minnesota (07)	Swanson, Harold 085	1	1	0
Purdue (10)	Bergren, G. Walter 086	1	1	0
	Diesslin, H. G. 087	1	1	0
Wisconsin	Ahlgren, Henry L. 088	1	1	0
	White, Maurice E. 089	1	1	0
	Shannon, Theo. J. 090	1	1	0
Geography (09)				
Chicago (01)	Mayer, Harold M. 091	3	0	0
Illinois (02)	Booth, Alfred W. 092	3	3	0
Northwestern (08)	Espenshade, Edward B. 093	3	3	0
Purdue (10)	Forster Walter 094	3	0	0
Wisconsin (11)	Olmstead Clarence W.095	3	0	0
	Sterling, Henry S. 096	3	0	0
Geology (10)				
Chicago (01)	Goldsmith 719	11	4	0
Illinois (02)	Shaffer, Paul 097	11	5	0
Indiana (03)	Patton, John B. 098	11	10	0
Iowa (04)	Tuttle, Sherwood 099	11	1	0

ACADEMIC AREA (ID NO.) INSTITUTION (ID NO.)	FACULTY MEMBER (ID NO.)	PROP SENT	EVAL RET	PROP ORIG
Geology (10) cont.				
Michigan (05)	Portman, Donald J. 100	11	2	1
	Briggs, L.I. 715	0	1	0
Michigan State (06)	Prouty, C.E. 101	11	9	0
	Sandefur, B. T. 102	11	0	0
Minnesota (07)	Zoltei, Tibor 103	11	10	1
Northwestern (08)	Howland, Arthur L. 104	11	10	0
Ohio State (09)	Goldthwait, Richard P. 105	11	10	1
Purdue (10)	Johnson, Robert 106	11	10	0
Wisconsin (11)	Cline, Lewis 107	11	5	0
	Maher, L.J. 816	0	1	0
Graduate School (11)				
Illinois (02)	Pasta, John 108	11	11	0
Iowa (04)	Spriesterbach, D. C. 109	11	2	0
	Scoff, Alvin H. 810	11	9	0
Minnesota (07)	Boddy, Francis M. 110	11	11	0
Purdue (10)	Waling, J.L. 111	11	11	0
Wisconsin (11)	Alberty, Robert A. 112	11	9	0
Health Sciences (12)				
Chicago (01)	Aldrich, K. 710	17	15	0
Illinois (02)	Bowman, Richard 113	17	3	0
	Smith, Nat E. 712	0	1	0
Indiana (03)	Bullard, Robert W. 114	17	0	0
	McDonald, Ralph E. 115	17	17	2
Iowa (04)	Dustan, Laura 116	17	6	0
	Carter, Robert E., 117	17	13	0

ACADEMIC AREA (ID NO.) INSTITUTION (ID NO.)	FACULTY MEMBER (ID NO.)	PROP SENT	EVAL RET	PROP ORIG
Health Sciences (12) cont.				
Iowa (04)	Aydelette, Myrtle K. 803	0	2	0
Michigan (05)	Bowman, Robert A. 118	17	0	0
	Conklin, James L. 119	17	16	0
	Deininger, Rolf A. 120	17	8	0
	Dodge, H.J. 121	17	0	0
	Dudley, Eugene F. 122	17	16	0
	Hinerman, D. F. 123	17	0	0
	Judge, Richard D. 124	17	14	0
	Malinoski, Bernadine M.125	17	1	0
	Okamoto, Rae H. 126	17	0	0
	Owings, Clyde 127	17	11	0
	Porter Richard J. 128	17	0	0
	Rondell, Paul 129	17	16	3
	Roscoe, Marjorie M. 130	17	0	0
	Schuman, Stanley H. 131	17	0	0
Michigan State (06)	Knisely, William H. 132	17	0	0
Minnesota (07)	Lazarow, Arnold 133	17	0	0
Northwestern (08)	Gregg, Walter 134	17	15	0
	Wells, J.A. 135	17	0	0
Ohio State (09)	Pace, William G. 136	17	1	0
Purdue (10)	Johnson, Helen 137	17	16	0

ACADEMIC AREA (ID NO.) INSTITUTION (ID NO.)	FACULTY MEMBER (ID NO.)	PROP SENT	EVAL RET	PROP ORIG
Health Sciences (07) cont.				
Wisconsin (11)	Meyer, Thomas C. 138	17	0	0
Interdisciplinary Programs (13)				
Chicago (01)	Koppelman, Ray 139	4	4	0
Indiana (03)	Sturgeon, Robert R. 140	4	0	0
Iowa (04)	Lloyd-Jones, Richard 141	4	3	0
	Braddock, Richard 142	4	0	0
	Zenor, M.D. 143	4	4	0
	McCarty, Harold 144	4	2	0
Michigan (05)	Tartet, Michael 145	4	4	0
	Remington, Richard D. 146	4	0	0
Purdue (10)	DeGroff, Harold 147	4	4	1
Wisconsin (11)	Ihde, Aaron 148	4	4	0
International Studies (14)				
Illinois (02)	Dangerfield, Royden 149	2	1	0
Iowa (04)	Van Dyke, Vernon 150	2	2	1
Northwestern (08)	Janda, Kenneth F. 151	2	2	1
	Guestkow, Harold 152	2	0	0
Wisconsin (11)	Hill, Henry 153	2	1	0
Journalism (15)				
Iowa (04)	Moeller, Leslie 154	1	1	0
Michigan (05)	Mauser, Wesley 155	1	1	0
Northwestern (08)	Webb, Eugene 156	1	1	0

ACADEMIC AREA (ID NO.) INSTITUTION (ID NO.)	FACULTY MEMBER (ID NO.)	PROP SENT	EVAL RET	PROP ORIG
Journalism (15) cont				
Wisconsin (11)	Nafziger, Ralph O. 157	1	0	0
	Gosdick, James A. 805	0	1	0
Languages (16)				
Illinois (02)	Meyers, Keith 158	10	10	1
Indiana (03)	Hodge, Carlton T. 159	10	8	0
Iowa (04)	Reese, Winston J. 160	10	10	0
	Oppenheimer, Max 161	10	8	1
Michigan (05)	O'Neill, James C. 162	10	10	0
Michigan State (06)	Hughes, N. 163	10	10	0
Minnesota (07)	Menze, Edwin F. 164	10	1	0
	Renaud, Armand 165	10	1	0
Northwestern (08)	Leslie, John K. 166	10	0	0
Ohio State (09)	Twarog, Leon I. 167	10	2	0
Purdue (10)	Randall, Earle 168	10	10	3
Wisconsin (11)	Mulvihill, Edward K. 169	10	10	0
Law (17)				
Chicago (01)	Ratcliffe, James M. 170	10	8	0
Indiana (03)	Kelso, Charles D. 171	10	9	0
Iowa (04)	David, Clifford 172	10	0	0
Michigan (05)	Conard, A.F. 173	10	0	0
	Cooperrider, Luke K. 174	10	10	0
	Proffitt, Roy F. 175	10	0	0
Minnesota (07)	Greene, Bruno H. 176	10	0	0

ACADEMIC AREA (ID NO.) INSTITUTION (ID NO.)	FACULTY MEMBER (ID NO.)	PROP SENT	EVAL RET	PROP ORIG
Law (17) cont				
Northwestern (08)	Ruder, David 177	10	10	0
Ohio (09)	Burke, William T. 178	10	10	1
Wisconsin (11)	Bilder, Richard 179	10	6	0
	Eckhardt, A. G. 806	0	1	0
Mathematics (18)				
Illinois (02)	Muller, David 180	17	0	0
Iowa (04)	Muhley, H. T. 181	17	17	0
Michigan (05)	Hay, G.E. 182	17	0	1
Northwestern (08)	Boas, Ralph 183	17	17	2
Ohio (09)	Fisher, Robert C. 184	17	16	0
Purdue (10)	Keller, M. Wiles 185	17	17	0
Wisconsin (11)	Van Engen, Henry 186	17	14	0
Pharmacy (19)				
Michigan (05)	Domino, E. F. 187	12	11	0
Purdue (10)	Miya, Tom S. 188	12	11	1
Wisconsin (11)	Sonnedecker, Glenn A. 189	12	10	0
Psychology (20)				
Chicago (01)	Fiske, Donald W. 190	14	14	0
Illinois (02)	Dulany, Don 191	14	0	0
Indiana (03)	Yamaguchi, Harry 192	14	11	0
Iowa (04)	Arenson, Sidney 193	14	14	0
Michigan (05)	Zinn, Karl L. 194	14	14	0
Michigan State (06)	Winder, Clarence L. 195	14	14	0

ACADEMIC AREA (ID NO.) INSTITUTION (ID NO.)	FACULTY MEMBER (ID NO.)	PROP SENT	EVAL RET	PROP ORIG
Psychology (20) cont				
Minnesota (07)	Darley, John D. 196	14	14	0
Northwestern (08)	Raskin, Nathanial 197	14	5	0
Purdue (10)	Rubenstein, Joe 198	14	0	0
Wisconsin (11)	Martin, Barclay 199	14	12	0
Space & Scheduling (21)				
Illinois (02)	Bareither, Harlan 200	1	1	0
Purdue (10)	Blakesley, J. F. 201	1	1	0
Wisconsin (11)	Cleary, James W. 202	1	1	0
Speech & Communications (22)				
Illinois (02)	Ince, Robert L. 203	10	7	0
Indiana (03)	Auer, J. Jeffery 204	10	0	0
Iowa (04)	Becker, Sam 205	10	10	0
	Harshbarger, H. Clay 206	10	10	2
Michigan State (06)	Oyer, Herbert J. 207	10	10	0
Minnesota (07)	Graham, Kenneth L. 208	10	0	0
	Howell, W.S. 804	0	10	0
Northwestern (08)	Roever, James 209	10	10	0
Ohio State (09)	Brooks, Keith 210	10	10	0
Purdue (10)	Nadeau, Ray 211	10	9	0
Wisconsin (11)	Dreyfus, Lee S. 212	10	9	0
Veterinary Sciences (23)				
Michigan State (06)	Reed, Charles F. 213	8	8	0
Ohio State (09)	Helwig, John H. 214	8	1	0
Purdue (10)	Bullard, John 215	8	8	0

ACADEMIC AREA (ID NO.) INSTITUTION (ID NO.)	FACULTY MEMBER (ID NO.)	PROP SENT	EVAL RET	PROP ORIG
Veterinary Sciences (23) cont				
Wisconsin (11)	Anderson, David 216	8	6	0
Music (24)				
Michigan (05)	Britten, Allan P. 217	4	4	3
Minnesota (07)	Schuessler Roy A. 218	4	0	0
	Caswell, Arnold 717	0	4	0
Chemistry (25)				
Michigan (05)	Mancy, K.H. 219	2	0	0
	Emerson, David W. 220	2	2	0
Northwestern (08)	Burwell, R. 714	2	1	0
Philosophy (26)				
Michigan (05)	Cohen, Carl 221	1	1	1
Physics (27)				
Michigan (05)	Camp, Paul R. 222	4	4	0
	Roll, Peter 223	4	4	0
	Suits, Gwynn 224	4	4	0
	Thoburn, Norman 225	4	4	0
Ohio State (09)	Nielsen, Harold H. 226	4	0	0
	Dickey, F.P. 718	4	1	0
Research (28)				
Ohio (09)	Stephenson, Robert C. 227	0	0	0
	Briggs, George E. 228	0	0	0
Administration (29)				
Illinois (02)	Thomas, C.R. 229	6	6	0
Indiana (03)	Ewers, Joseph R. 230	6	0	0
	Jordan, James R. 231	6	3	0
Iowa (04)	Boyd, Willard 232	6	1	0
Michigan (05)	Spradlin, Paul A. 233	6	5	0
	Zimmerman, Ernest 234	6	6	0

ACADEMIC AREA (ID NO.) INSTITUTION (ID NO.)	FACULTY MEMBER (ID NO.)	PROP SENT	EVAL RET	PROP ORIG
Administration (29) cont				
Michigan (05)	Ericksen, Stan 235	6	1	0
Michigan State (06)	King, Herman 236	6	5	1
	Johnson, 812	6	2	0
Minnesota (07)	Smith, Donald K. 237	6	4	0
Ohio State (09)	Riddle, Jackson W. 238	6	4	0
	Cook, L.V. 811	0	1	0
Purdue (10)	Hicks, John 239	6	6	0
Wisconsin (11)	Carbone, Robert 240	6	6	0
	Percy, Donald E. 241	6	5	0
Admissions & Registrar (30)				
Chicago (01)	Sullivan, Maxine 242	7	7	0
Indiana (03)	Harrell Charles E. 243	7	6	0
	Bly, Harold J. 244	7	7	0
	Rebhun, Herbert 245	7	7	0
	Scherer, Don 246	7	0	0
Iowa (04)	Rhoades, Don 247	7	7	0
Michigan (05)	Groesbeck, Byron 248	7	0	0
Michigan State (06)	Carey, Terrence 249	7	2	0
	Stoneman, James V. 250	7	0	0
	King, Horace C. 251	7	6	0
Ohio (09)	Thompson, Ronald B. 252	7	7	0
Purdue (10)	Parkhurst, Nelson, 253	7	7	0
Wisconsin (11)	Fingerson, Roy J. 254	7	7	0

ACADEMIC AREA (ID NO.) INSTITUTION (ID NO.)	FACULTY MEMBER (ID NO.)	PROP SENT	EVAL RET	PROP ORIG
Broadcast Units (31)				
Chicago (01)	Buckstaff, John B. 255	2	2	0
Illinois (02)	Schooley, Frank 256	2	2	0
Indiana (03)	Feddersen, Don 257	2	2	0
Iowa (04)	Menzer, Carl 258	2	2	0
Michigan (05)	Burrows, E. G. 259	2	1	1
Michigan State (06)	Hunter, Armand 260	2	2	0
Minnesota (07)	Goldstein, Sheldon 261	2	0	0
Northwestern (08)	Hunter, Charles F. 262	2	2	0
Ohio State (09)	Hull, Richard B. 263	2	2	0
Purdue (10)	DeCamp, John 264	2	1	0
Wisconsin (11)	McCarty, H. B. 265	2	2	0
Business Office (32)				
Illinois (02)	Parker, Robert 266	3	3	0
Indiana (03)	Meglemre, Tom C. 267	3	3	0
Iowa (04)	Jolliffe, Elwin 268	3	3	0
Michigan State (06)	Pierson, Merrill 269	3	0	0
Minnesota (07)	Grambsch, Paul V. 270	3	3	0
Ohio State (09)	Cook, Leonard V. 271	3	2	0
	Oster, Clinton 272	3	2	0
Purdue (10)	Dawson, Alfred 273	3	3	0
Wisconsin (11)	Lorenz, Reuben H. 274	3	3	0

ACADEMIC AREA (ID NO.) INSTITUTION (ID NO.)	FACULTY MEMBER (ID NO.)	PROP SENT	EVAL RET	PROP ORIG
Computer and Data Processing (33)				
Chicago (01)	Miller, R.H. 720	4	4	0
Illinois (02)	Chaney, John 275	4	2	0
Indiana (03)	Hagstrom, Stanley 276	4	3	0
Iowa (04)	Weeg, Gerald 277	4	3	0
Michigan State (06)	Martin, F.B. 278	4	0	0
	Reid, Richard J. 279	4	4	0
Northwestern (08)	Van Ness, James E. 280	4	4	0
Ohio (09)	Brady, Ronald W. 281	4	4	0
	Black, James A. 282	4	4	0
Purdue (10)	Conte, Sam 283	4	4	0
Wisconsin (11)	Muller, Mervin 284	4	0	0
Institutional Studies (34)				
Illinois (02)	Zeigler, Martin 285	2	2	0
Indiana (03)	Hull, L.E. 286	2	2	2
	D'Amico, Louis A. 287	2	0	0
Minnesota (07)	Burriss, Russell 288	2	0	0
Purdue (10)	Hirschl, Harry H. 289	2	2	0
Libraries & Audio Visual (35)				
Chicago (01)	Ennis, Philip 290	12	12	0
	Fussler, Herman 291	12	12	0
Illinois (02)	Oram, Robert W. 292	12	7	0
	Stenstrom, Ralph 713	0	1	0
Indiana (03)	Baatz, Wilmer H. 293	12	6	0

ACADEMIC AREA (ID NO.) INSTITUTION (ID NO.)	FACULTY MEMBER (ID NO.)	PROP SENT	EVAL RET	PROP ORIG
Libraries & Audio Visual (35) cont				
Indiana (03)	Faris, Gene 294	12	12	1
	Flener, Jane 295	12	4	0
	Herrick, Merlyn C. 296	12	12	0
	Larson, L. C. 297	12	3	0
	Moldstad, John 298	12	0	0
	Raber, Nevin 299	12	12	1
	Reynolds, Michael M. 300	12	10	0
	Sherman, Mendel 301	12	10	3
Iowa (04)	Cochran, Lee 302	12	12	0
	Dunlap, Leslie 303	12	3	1
	Bentz, Dale 813	0	7	0
Michigan (05)	Treyz, Joe 304	12	0	0
	Dunlap, Connie R. 305	12	0	0
	Faucher, Rose-Grace 306	12	11	0
	Flanders, Clover M. 307	12	0	0
	Forrest, Della 308	12	0	0
	Gantt, John G. 309	12	0	0
	Jameson, Harriet C. 310	12	3	0
	Liesener, James 311	12	0	0
	Maxfield, David K. 312	12	0	0
	Muller, Robert H. 313	12	6	0
	Tysse, Agnes 314	12	1	0
	Wagman, Frederick H. 602	0	1	2

ACADEMIC AREA (ID NO.) INSTITUTION (ID NO.)	FACULTY MEMBER (ID NO.)	PROP SENT	EVAL RET	PROP ORIG
Libraries & Audio Visual (35) cont				
Michigan (05)	Craig, E.S.	0	1	0
Michigan State (06)	Schuller, Charles 315	12	11	0
	Chapin, Richard 316	12	10	0
Minnesota (07)	Stanford, Edward 317	12	0	0
	Grabon, Wesley 708	0	1	0
	Hopp, R.H. 814	0	11	0
Northwestern (08)	Nyholm, Jens 318	12	6	0
Ohio State (09)	Pimsleur, Paul 319	12	3	0
	Branscomb, Lewis 320	12	7	1
	Miller, Thomas E. 817	0	8	0
Purdue (10)	Moriarty, John 321	12	1	1
	Dowden, Keith 716	0	1	0
Wisconsin (11)	Kaplan, Louis 322	12	7	0
	White, Frederick A. 323	12	10	0

Special Areas (36)

(A very general category including highly specialized programs. Although several proposals were originated by individuals listed below, no proposals were distributed to members of this group)

Indiana (03) ARAC	Timms, Howard L. 324
Iowa (04) Iowa Testing Service	Lindquist, E.F. 325
Liberal Arts Deans	Stuit, Dewey B. 326
Purdue (10) CIC Ad Hoc Committee	Seibert, Warren 327
CIC Economic Dev Committee	Weiler, E. T. 328

ACADEMIC AREA (ID NO.) INSTITUTION (ID NO.)	FACULTY MEMBER (ID NO.)	PROP SENT	EVAL RET	PROP ORIG
Special Areas (36) cont				
Purdue (10)				
TPRC	Touloukian, Y.S. 329			
ECS Staff	Glade, John 601			
ECS Staff	Roeth, Harold 605			
ECS Staff	Miles, James 606			
Wisconsin (11)				
CIC Ad Hoc Committee	Lambert, Phillip 330			
Aerospace Research Application	Ragotzkie, Robert 331			
Argonne Laboratories	Hirschfelder, Joseph 332			

TABLE VI

Proposal Origination by Institution

This table is oriented by institution and lists individuals who submitted "ideas" or proposals for ECS use, their institutions, their areas of interest, the number of ideas submitted and the number of proposals which resulted. In many cases, it was presumed by the ECS staff that a proposal intended for one discipline would be applicable for other disciplines. Therefore, it should be noted that the tallies in the "proposal" column often exceed those in the "idea" column.

Although approximately 30% of the faculty cooperating with the study submitted suggested proposals for ECS use, many such suggestions were essentially duplications of ones received earlier. In most cases, the names included in this table are those of faculty whose suggestions were received on earliest dates.

	NAME	INSTITUTION	AREA	IDEAS	PROPOSALS
1.	Linwood Brightbill	Illinois	Architecture	1	1
2.	Marlowe Slater	Illinois	Education	1	8
3.	Keith Meyers	Illinois	Languages	1	1
4.	L.E. Hull	Indiana	Institutional Studies	2	7
5.	Gene Faris	Indiana	Library & A-V	1	1
6.	Nevin Raber	Indiana	Library & A-V	1	1
7.	Mendel Sherman	Indiana	Library & A-V	3	3
8.	Ralph E. McDonald	Indiana	Health Sciences	2	2
9.	Vernon Van Dyke	Iowa	International Studies	1	1
10.	F.C. Blodi	Iowa	Health Sciences	1	1
11.	Max Oppenheimer	Iowa	Languages	1	8
12.	Clay Harshbarger	Iowa	Speech & Communications	2	5
13.	Leslie Dunlap	Iowa	Libraries & A-V	1	10
14.	John Allen	Michigan	Biology	4	24

	NAME	INSTITUTION	AREA	IDEAS	PRO-POSALS
15.	George Nace	Michigan	Biology	2	14
16.	Donald L. Portman	Michigan	Geology	1	1
17.	Edward F. Domino	Michigan	Pharmacy	1	1
18.	Paul Rondell	Michigan	Health Sciences	3	17
19.	Mildred French	Michigan	Athletics	2	7
20.	Allan P. Britten	Michigan	Music	3	3
21.	G. E. Hay	Michigan	Mathematics	1	1
22.	Carl Cohen	Michigan	Philosophy	1	7
23.	Byron Grosbeck	Michigan	Admissions & Registrar	1	1
24.	Ed Burrows	Michigan	Broadcast Units	1	1
25.	Frederick Wagman	Michigan	Libraries & A-V	2	2
26.	Louis A. Doyle	MSU	Extension	1	1
27.	Herman King	MSU	Administration	1	2
28.	Tibor Zoltai	Minnesota	Geology	1	9
29.	Karl Kenize	Northwestern	Astronomy	1	1
30.	John Hilliard	Northwestern	Engineering	7	59
31.	Kenneth Janda	Northwestern	International Studies	1	2
32.	Ralph Boas	Northwestern	Mathematics	2	3
33.	Frederick R. Cyphert	OSU	Education	1	1
34.	Richard P. Goldthwait	OSU	Geology	1	1
35.	William T. Burke	OSU	Law	1	2
36.	Lewis Branscomb	OSU	Library & A-V	1	1
37.	Arne Slettebak	OSU	Astronomy	1	1
38.	Roy F. Reeves	OSU	Computer & Data Processing	1	1
39.	Harold DeGroff	Purdue	Interdisciplinary Programs	1	6

	NAME	INSTITUTION	AREA	IDEAS	PROPOSALS
40.	Earle Randall	Purdue	Languages	1	6
41.	Elton Hocking	Purdue	Languages	2	12
42.	Tom S. Miya	Purdue	Pharmacy	1	5
43.	John Moriarty	Purdue	Library & A-V	1	1
44.	Warren Seibert	Purdue	Special	1	6
45.	ECS Staff				
46.	ECS Staff				
47.	ECS Staff			7	14
	47	9	26	74	262

TABLE VII

In this table, proposals for ECS use have been processed with regard to a number of specific practical questions. The first column indicates the broad categories of proposal usage followed by more specific questions within the broad categories. The second column tallies the number of proposals concerned with specific proposal elements. The third column indicates the mean ratings (or evaluations) given those proposals by faculty members for questions 5, 6 and 7 on the evaluation form.

Evaluations were ranked on a five-point scale ("0" = low, "4" = high)

Question 5:	"To what extent will the proposed actions resolve the stated problem(s)?"
Question 6:	"To what extent would you personally wish to see the proposed actions undertaken?"
Question 7:	"Among your colleagues, to what extent would the proposed actions be supported or encouraged?"

Distribution and Evaluation of Proposal Elements
Base No. of Proposals: 262

I. Purpose of Communication?	No. Proposals	Mean 5, 6, 7
A. for development or discussion of specific research problems or projects	61	2.0
B. for administrative puposes of departments, schools	48	1.8
C. regular teaching of undergraduates	42	2.0
D. gaining access to library materials or reference services of distant institution	26	2.5
E. regular teaching of graduates and undergraduates	16	2.1
F. regular teaching of graduates	16	2.3
G. for seminars or colloquia	16	2.2
H. business office or related non-academic use	9	2.0
I. non-teaching services for students	8	1.8
J. community, continuing education or public service	7	2.4
K. other or miscellaneous	4	2.2

		No. Proposals	Mean 5, 6, 7
II.	Is the Proposed Use to be Regularly Scheduled? (occurring at predictable intervals?)		
	A. Yes	169	2.1
	B. No	93	ND
III.	What is Duration of Each Use?		
	A. 45-59 minutes	106	2.0
	B. 90 minutes or more	50	2.1
	C. Unspecifiable or unknown	45	2.3
	D. 60-89 minutes	26	2.4
	E. 5-14 minutes	13	1.8
	F. 15-29 minutes	11	1.7
	G. 30-44 minutes	10	1.9
IV.	About How Frequently Will Proposed Use Recur?		
	A. About monthly	75	2.0
	B. About weekly	58	1.9
	C. About daily	41	2.3
	D. About every 60 days	31	2.4
	E. About twice monthly	24	2.0
	F. About quarterly	22	2.1
	G. About semi-annually	9	1.8
	H. About annually	1	1.7
V.	How Many Institutions Will Be Connected to Accomplish the Proposed Use?		
	A. 2 institutions	110	2.2
	B. 11 institutions	99	2.1
	C. 1 institution connected to an outside source	10	2.7
	D. 9 institutions	9	1.9
	E. 10 institutions	8	2.2
	F. 3 institutions	6	2.3
	G. 8 institutions	6	2.0
	H. 6 institutions	5	1.7
	I. 4 institutions	4	2.7
	J. 5 institutions	1	2.7
VI.	What is Role or Classification of Sender (or "Transmitter")?		
	A. Professor in role of teacher	76	2.0
	B. Professor in role of researcher-scholar	54	2.1

		No. Proposals	Mean 5, 6, 7
VI.	What is Role or Classification of Sender (or "Transmitter")? cont		
	C. Graduate student	37	1.9
	D. Computer	24	2.3
	E. Librarian or "information retrieval specialist"	17	2.3
	F. Administrator other than department head	15	2.1
	G. Professor in other role, e.g., administrative	15	1.8
	H. Department head	13	2.0
	I. Other or miscellaneous	8	2.5
	J. Undergraduate student	1	1.9
	K. FM radio broadcast	1	3.0
VII.	What is Role or Classification of Receiver?		
	A. Professor in role of researcher-scholar	91	2.2
	B. Undergraduate student	53	1.9
	C. Graduate Student	29	1.9
	D. Administrator other than department head	23	1.9
	E. Department head	22	2.0
	F. Professor in other role, e.g., administrative	17	1.8
	G. Professor in role of teacher	12	2.2
	H. Other or miscellaneous	7	2.4
	I. Librarian or "information retrieval specialist"	6	2.4
	J. FM radio broadcast	1	3.3
VIII.	Must Communications Be One Way or Two Way?		
	A. Two way communication needed	258	2.1
	B. One way communication needed	2	1.7
IX.	How many are Classed as Senders?		
	A. "one"	182	2.1
	B. "several" (i.e., 6-11)	54	2.1
	C. "few" (2-5)	19	1.9
	D. "many" (12 or more)	32	1.6

		No. Proposals	Mean 5, 6, 7
X.	How many are Classed as Receivers?		
	A. "many" (12 or more)	122	2.2
	B. "one"	60	2.0
	C. "several" (6-11)	46	2.1
	D. "few" (2-5)	32	1.9
XI.	What Media Should be Used?		
	A. Audio (telephone)	223	2.0
	B. Slow-scan TV	165	2.1
	C. Electro-writer	127	2.0
	D. Telelecture (with various media)	78	2.2
	E. Teletype	53	2.2
	F. Computer	40	2.2
	G. Facsimile	22	2.2
	H. Conventional TV	15	2.1
	I. FM Radio	1	3.3

TABLE VIII

Some of the 262 proposals for ECS use prescribed only one medium as necessary to accomplish the intended purposes; others suggested a combination of media. This table indicates specific patterns of media, the number of proposals calling for each pattern and the mean ratings of questions 5, 6, and 7 for those proposals. (Recall that the structure of most questions and proposals deliberately de-emphasized broadcast-standard television)

Distribution and Evaluation of Proposals by Media Patterns

	Media Patterns	No. Proposals	Mean 5, 6, 7
1.	Audio, electro-writer, slow-scan TV	62	2.1
2.	Audio, electro-writer, slow-scan TV (for telelecture)	52	2.1
3.	Audio, slow-scan TV	25	2.0
4.	Audio (for telelecture)	22	2.1
5.	Audio only	16	1.8
6.	Audio with conventional TV	15	2.9
7.	Teletype, computer data	13	1.8
8.	Teletype, slow-scan TV, computer data	9	2.4
9.	Audio, teletype, slow-scan TV, computer data, facsimile	7	2.2
10.	Audio, electro-writer, teletype, computer data	6	1.7
11.	Audio, electro-writer	6	2.1
12.	Teletype only	6	1.9
13.	Teletype, slow-scan TV, facsimile	3	2.2
14.	Audio, facsimile	3	2.6
15.	Audio, teletype, computer data, facsimile	3	1.9
16.	Audio, FM broadcast	2	3.3
17.	Teletype, facsimile	2	2.1
18.	Computer data only	1	2.6
19.	Slow-scan TV, facsimile	1	1.7
20.	Teletype, slow-scan TV	1	2.3
21.	Audio, teletype, computer data	1	2.2
22.	Audio, teletype, slow-scan TV for telelecture	1	3.5
23.	Audio, slow-scan TV, facsimile	1	1.7
24.	Audio, electro-writer for telelecture	1	2.4
25.	Audio, slow-scan TV, facsimile for telelecture	1	2.2
26.	Audio, slow-scan for telelecture	1	1.8

TABLE IX

This table suggests a priority of media needs as called for in the 262 proposals for ECS use. Attention is called to No. 9 below (FM broadcast). One of the proposals calling for this medium was of an omnibus nature suggesting several hours daily use of the ECS schedule for radio programs. (Recall that the structure of most questions and proposals deliverately de-emphasized broadcast-standard television)

Summary of Media Needs

Number of proposals which include a need for:

1.	Audio	224
2.	Slow-scan TV	164
3.	Electro-writer	127
4.	Telelecture	78
5.	Teletype	52
6.	Computer data	40
7.	Facsimile	21
8.	Conventional TV	15
9.	FM Broadcast	2

TABLE X

One assumption that was made in the very early stages of ECS planning was that an interconnection facility would be the ideal vehicle for educational radio network broadcasting. The question of programming a regional educational radio network, of course, would have to be answered by the broadcast managers involved. This table is essentially the response of the radio managers to a special omnibus proposal regarding programming. The total number of responses is included in the response portions of the questionnaire.

Programming a CIC Radio Network (Proposal No. 253)

If the ECS interconnecting facilities become a reality, the question of the exchangeability of locally produced programs will be with us again. Consequently, your feelings on the subject are needed. Please indicate your reactions to the following statements and questions. Also, please use additional pages, if necessary, to comment on any of the issues expressed herein or on other ideas that are germane to this use of ECS.

Please respond to the statements below by circling a number on the scale to the right of each statement. On each scale, a "4" corresponds to complete or full agreement, "0" denotes complete disagreement or negative feelings toward the statement, the other numbers represent intermediate shades of agreement-disagreement.

Rank	Mean		High				Low
			4	3	2	1	0
1	3.55	International programs should be offered on the ECS Network	7	1		1	
2	3.55	Programs calling for participation by faculty members of several schools should be offered on the ECS Network	5	4			
3	3.44	Cultural programs should be offered on the ECS Network	6	2		1	
4	3.44	Informational programs should be offered on the ECS Network	7	1			1

			High				Low
Rank	Mean		4	3	2	1	0
5	3.44	News analysis programs should be offered on the ECS Network	6	2	1		
6	3.22	Programs featuring speeches by distinguished campus visitors should be offered on the ECS Network	4	3	1		
7	3.22	Drama programs should be offered on the ECS Network	4	4		1	
8	3.00	News Programs should be offered on the ECS Network	5	2		1	1
9	2.88	Live music programs should be offered on the ECS Network	3	3	2	1	
10	2.88	Reporting on research programs should be offered on the ECS Network	3	2	4		
11	2.77	An exchange of programs between radio stations owned and operated by CIC institutions will improve the program quality of each station	2	4	3	1	
12	2.55	Programs from the CBC should be offered on the ECS Network	3	1	4		1
13	2.44	Programs from the Eastern Educational Radio Network should be offered on the ECS Network	3	2	2		2
14	2.44	Children's programs should be offered on the ECS Network	2	2	4		1
15	2.00	Book programs should be offered on the ECS Network	1	2	3		2

Rank	Mean		High 4	3	2	1	Low 0
16	1.88	Broadcast courses should be offered on the ECS Network	1	2	3	1	2
17	1.44	Agricultural programs should be offered on the ECS Network		2	2	3	2
18	1.33	Women's programs should be offered on the ECS Network		1	3	3	2
19	1.33	Safety and health programs should be offered on the ECS Network		1	4	1	3
20	1.22	Sports programs should be offered on the ECS Network		1	4		4
21	1.22	Variety programs should be offered on the ECS Network		1	3	2	3
22	.44	Recorded music programs should be offered on the ECS Network			1	2	6

PLEASE ANSWER THE FOLLOWING QUESTIONS BY CHECKING THE ALTERNATIVE YOU PREFER

23. For each of the five weekdays, what amount of programming could your station make available to the Network?

a ___ None　d _1_ 1-1/2 hr.　g _1_ 3 hrs. or more

b _2_ 1/2 hr.　e ___ 2 hr.

c _5_ 1 hr.　f ___ 2-1/2 hr.

24. For each of the five weekdays, what amount of programming could your station utilize from the ECS Network?

a ___ None　d _1_ 1-1/2 hr.　g _3_ 3 hrs. or more

b ___ 1/2 hr　e _1_ 2 hrs.　_2_ NA

c _2_ 1 hr.　f ___ 2-1/2 hrs.

PLEASE RESPOND TO THE FOLLOWING QUESTIONS BY CHECKING THE APPROPRIATE BOX.

25. Could your station clear the 5-6 PM hour daily for a network news program with appropriate cutouts for the insertion of local commentary, campus news, and state news? Yes 5 No 3 NA 1

26. Would your station be willing to originate a six hour block of programs from 12 noon to 6 PM every eleventh Sunday guaranteeing programs would be suitable for broadcast by all stations of the network? Yes 5 No 1 NA 3

27. Would your station be willing to take six hours of recorded programming each Sunday afternoon from 12 to 6 PM if it were suitable for local broadcast? Yes 3 No 4 NA 2

28. Would your station be willing to provide local coverage of appearance by guests from other CIC institutions and feed these to the station at the guest's home campus. Yes 8 No 0 NA 1

29. Could your station record three hours of network material daily for delayed broadcasts later within the succeeding 24 hour period? Yes 6 No 2 NA 1

30. Would your institution be able to provide office space and local facilities for an ECS radio network manager and staff (maximum four individuals)? Yes 4 No 3 NA 2

31. Could your station participate in a morning round robin weather report with one minute of weather observation coming from each cooperating radio station? Yes 6 No 3

DISCUSSION

In the discussion under METHOD, ample evidence is given of the cooperation extended the ECS study by the CIC.

We believe that the suggestions for ECS use which were submitted by participating faculty members were motivated by real communications needs. The evaluation of the various proposals for ECS use also was done by thoughtful, concerned faculty members. The results of their work in these two activities (suggesting and evaluating uses) should be distilled to the essence of the most needed and valuable for a pilot period of operation.

It is our purpose here to interpret in rather general terms the manner in which ECS would best be applied to the basic operations of the CIC institutions as expressed by participating faculty responses to the study. The categories used for this purpose are taken from the study itself and may be broadly labeled "Purposes of Communication".

Preceding the discussion in each category is a table which indicates the overall response to proposals calling for the particular purpose of communication in question and which then "weeds out" those proposals which were not evaluated positively. The table then derives a new, perhaps more realistic, quantitative evaluation.

1. Purpose of Communication: Research Activities

(The "questions" referred to in the table below are those in the standard evaluation form used by all faculty participants, i.e.,)

Question 2	"To what extent do you feel personally concerned with the problem?"
Question 3	"Among your colleagues, to what extent would the stated problem be a recognized concern?"
Question 5	"To what extent will the proposed actions resolve the stated problems?"
Question 6	"To what extent would you personally wish to see the proposed actions undertaken?
Question 7	"Among your campus colleagues, to what extent would the proposed actions be supported and encouraged?"

Research Activities

A.	No. of Proposals	B.	No. of proposals with mean rating of 2.0 or higher for questions "2" & "3" together
	61		25
C.	Percentage (B. of A.)	D.	No. proposals in B with mean rating of 2.0 or higher for questions "5", "6", & "7"
	40%		22
E.	Percentage (D. of B.)	F.	Mean rating of questions "5", "6", & "7" for proposals in D.
	88%		2.6

Since the conclusion of World War II the research activities of colleges and universities in the United States have been in a rapidly ascending spiral. While many such activities have been basic in nature and directed toward the discovery of new knowledge, many have also been tied to graduate student programs. The problem of duplication of the research effort is of real concern to the researchers and administrators on college campuses. There are many instances of duplicated supported research efforts in the higher education community. Is there, then, some better way that information regarding past and present research activities can be made available to individual researchers? ECS was seen as a potential solution to this problem inasmuch as it could put the researchers in direct contact with each other. It could also make available research consultation where necessary. It could lead to further uses of research indices already compiled which now are oftentimes frustratingly inaccessable.

Of all the purposes proposed for ECS use, the general category of research appears to have strongest support from faculty members cooperating with the study (see Table VII).

The proposals in this category ranged from routine telephone conferences between principals to the exchange of graphic or digital data.

Those areas which appear most likely to use ECS for this general purpose are:

- Biology
- Education
- Engineering
- Geology
- Graduate Schools
- Health Sciences
- Psychology
- Veterinary Medicine

Areas of interest which demonstrated much less enthusiasm for the proposals in this category are:

- Language
- Law
- Mathematics
- Pharmacy

Identical proposals were sent to several subject matter areas in some cases. It is interesting to note that the acceptance of these proposals varied from one subject matter area to the next. For example, a proposal suggesting that plans for specialized lab equipment used in research work could be made available to colleagues at other institutions was rated in the biology area, but relatively low in the health sciences.

One can conclude from available data that, although a large number of proposals were in the general category of assistance to research, those submitted represent only a token number in this largely unexploited field.

2. Purpose of Communication: Administrative
(Schools, Departments,
Business Offices, etc.)

(The "questions" referred to in the table below are those in the standard evaluation form used by all faculty participants, i.e.)

Question 2	"To what extent do you feel personally concerned with the problem?
Question 3	"Among your colleagues, to what extent would the stated problem be a recognized concern?"
Question 5	"To what extent will the proposed actions resolve the stated problem?"
Question 6	"To what extent would you personally wish to see the proposed actions undertaken?"
Question 7	"Among your campus colleagues, to what extent would the proposed actions be supported and encouraged?"

Administrative

A. No. of proposals	B. No. of proposals with mean rating of 2.0 or higher for questions "2" & "3" together
57	35
C. Percentage (B. of A.)	D. No. proposals in B. with mean rating of 2.0 or higher for questions "5", "6" & "7"
61%	24
E. Percentage (D. of B.)	F. Mean rating of questions "5", "6" & "7" for proposals in D.
69%	2.5

As institutions of higher learning become even larger, administrative duties become more and more complex. As with any management function, certain patterns are observed in these institutions of higher learning, and a great deal can be gained by the exchange of experiences, procedures and systems. Electronic interconnection is seen also as a means to reduce the necessity for a significant amount of travel between institutions.

Nearly sixty proposals had as their general purpose the use of ECS to assist with administrative problems at the interinstitutional level. Using ECS for administrative purposes can be divided into two general categories: (1) administrative affairs common to departments and schools; (2) those business affairs commonly associated with the administrative arm of the university.

Eight academic areas received identical proposals which suggested a monthly conference call between department head counterparts (proposal 104). The proposal suggested that provisions should be made to allow the transmission of visual material and/or use of the electro-writer to transmit handwritten notations in addition to the telephone.

Faculty respondents in the following subject-matter areas rated the proposal favorably:

Athletics
Education
Languages
Speech

Less favorable response came from:

Biology
Engineering
Mathematics
Psychology

Similar proposals which suggested regular conferences between division heads were distributed to six academic areas and were rated favorably by faculty members representing education, languages and speech (proposal 112). Again, biology, engineering and mathematics looked upon this use of ECS less favorably.

It is clear that ECS would provide a new and useful service to assist with the administrative affairs among academic departments. The conclusion might also be drawn that some departments would not avail themselves of this service in its early stages.

Proposals aimed at improving interinstitutional cooperation and communication were directed to the following administrative areas:

Schedules & Space Offices
Admissions and Registrars
Business Offices
Administration
Libraries & AV Centers
Institutional Studies

Again, the proposals generally called for regular telephone conferences between counterparts in the various areas and included provision for exchange of graphic, teletype or digital information (proposals 78, 137, 139, 218). High acceptance by administrators who evaluated the proposals is notable in all of the areas except the business offices.

Several proposals for ECS use were directly related to problems of recruitment on the faculty and graduate student level. Some fifteen subject matter areas received proposals in this general category. However, there does not appear to be any particular pattern of acceptance among the areas. For example, a proposal suggesting that ECS facilities be used for interviewing prospective graduate students (proposal 118) received favorable response from faculty respondents in:

Biology
Veterinary Science
Engineering
Registrar and Admissions

It was not favorably received by faculty respondents in:

Astronomy
Law
Psychology
Economics
Pharmacy

Engineering and biology faculty members received and responded to the same three proposals in this category. Both areas responded similarly to each of the proposals as stated above and both areas registered general acceptance of the proposal which would allow graduate student interviews to be conducted on ECS. Both engineering and biology faculty members were less enthusiastic about a proposal calling for a CIC consortium for faculty recruitment (proposal 201). Likewise, faculty of both disciplines rated rather low a proposal suggesting that department or division heads might use ECS to consult with the former mentor of a prospective graduate student.

Language was the only area of the fifteen that seemed to see any usefulness to the proposal calling for a consortium for faculty recruitment. The most frequently recurring comment in opposition to this proposal was the claim that prospects for faculty recruitment could not be pooled successfully because competition in faculty recruitment is too real.

This use of the system for recruitment pruposes does not appear to be among the most promising or desirable when overall faculty evaluation of such proposals is considered.

3. Purpose of Communication: Instruction

(The "questions" referred to in the table below are those in the standard evaluation form used by all faculty participants, i.e.,)

Question 2	"To what extent do you feel personally concerned with the problem?"
Question 3	"Among your colleagues, to what extent would the stated problem be a recognized concern?"
Question 5	"To what extent will the proposed actions resolve the stated problems?"

Question 6 "To what extent would you personally wish to see the proposed actions undertaken?"

Question 7 "Among your campus colleagues, to what extent would the proposed actions be supported and encouraged?"

Instruction

	A. No. of Proposals	B. No. of proposals with mean of 2.0 or higher for questions "2" & "3" together	C. Percentage (B. of A.)
Undergrads	42	21	50%
Grads	16	10	63%
Undergrads & Grads	16	8	50%
Summary	74	39	54%

	D. No. of proposals in B. with mean of 2.0 or higher for ques. "5", "6" & "7" together	E. Percentage (D. of B.)	F. Mean rating of questions "5", "6" & "7" for proposals in D.
Undergrads	17	81%	2.6
Grads	9	90%	2.7
Undergrads & Grads	6	75%	2.5
Summary	32	82%	2.6

With the mounting increase in enrollments, it was predictable that both administration and faculty would look with favor upon additional ways to exchange instructional materials that would complement the present exchange of printed instructional material. Early attempts in this field were pointed toward help with the "large enrollment" problem areas. Later attempts (and more successful ones) have been aimed at the unique courses and small enrollment areas. As the newer sub-disciplines grow, competent instructors in unique areas become fewer and fewer. What can be done to share these rather rare instructors with the very students on each campus who need this type of instruction? As a partial answer to this problem, the CIC has developed the Traveling Scholar Program. Although a young operation its success is assured. It has many problems in the areas of possessiveness, dislocation, and compatibility that will take a generation or more to eliminate. If, however, valuable results can be obtained without the major professor losing his graduate student for a semester and without the graduate student having to move physically to another geographic location and with the acceptance of his credits being assured, it would seem that this would be a step in the right direction. Another fertile area for investigation is the possibility of guest lectures for individual lessons or units of lessons within more broadly based courses. Here again, travel and time away from regular duties created major limitations to the use of such individuals. It was apparent that some form of communications system could materially accelerate exchange of unique, unusual, and distinquished instruction.

Nearly seventy proposals were directed toward the use of the system for regular instruction (See Table VII). Among the unusual uses suggested were these:

1. The production of special videotape recordings of lecture-demonstrations by specialists in a given field. These videotapes then would be duplicated and distributed to participating institutions. The tapes would be played on all participating campuses simultaneously, and following their showing, a live audio discussion would be conducted between the instructor and participating groups via ECS.

2. An environmental control course for architecture students would be developed jointly by faculty members of several campuses and taught via ECS for architecture classes on all campuses.

3. A special education course would feature regular guest lecturers from The U.S. Office of Education, the NEA and various east coast institutions via ECS.

Number one above was distributed to faculty members in fourteen subject-matter areas. Responses from the following areas can be classified as favorable:

- Architecture
- Graduate Schools
- Law
- Pharmacy
- Veterinary Science
- Mathematics

Responses from these areas were rated lower:

- Astronomy
- Biology
- Economics
- Education
- Geography
- Psychology
- Speech
- Engineering

Nearly twenty subject-matter areas received proposals which had as their purpose regular instruction. For the most part the suggested uses saw ECS as a means to provide instructional services that might otherwise be unavailable. A large share of these proposals called for telelecture techniques which provided for visual display and two-way audio.

The general category of instruction would appear to be one of the most fruitful areas to investigate during a pilot period. Implied in all applications of instruction via ECS are serious questions of organization, jurisdiction, faculty relations, accreditation, etc. However, the many favorable responses from faculty members in the CIC seem to indicate that these problems are not insurmountable.

With the growth in numbers of graduate students (particularly on the CIC campuses, which are responsible for 30% of the advanced degrees granted in this country) thesis and dissertation examinations and topics are a major concern.

Three basic proposals were developed and distributed in this general category. All of those proposals foresaw advantages in involving a faculty member from another institution in a consultative way or as a regular member of a Ph.D. committee. The proposals were distributed among eleven of the subject matter areas. Overall acceptance of the basic idea of utilizing ECS to broaden Ph.D. programs would appear to be high.

One proposal called for an ECS thesis conference between the Ph.D. candidate and an "expert" faculty member on another campus (proposal 085). The evaluations of this proposal as given by the five astronomy respondents would indicate that they did not think much of the idea. However, those in biology who responded to the same proposal rated it very high.

Areas which received proposals in this category are:

Architecture
Astronomy
Biology
Economics
Education
Engineering
Graduate School
Law
Pharmacy
Veterinary Science
Admissions and Registrars

Law and Pharmacy are the only areas which did not exhibit general approval of the use of ECS for this purpose.

Five respondents from CIC graduate schools did not rate very high the proposal which suggested that a professor from a distant campus should participate in a local Ph.D. oral exam. However, the respondents felt more positively toward the other two proposals in this category. One suggests that a distant professor could, by virtue of ECS, be a member of a local Ph.D. committee and the other suggests that Ph.D. candidates could consult with a distant professor about his dissertation via ECS. Concern was expressed by some faculty members in their comments on the proposals suggesting an ECS thesis conference. It was felt that a careful screening process would be needed to assure that (1) the professor's time would be available only on his terms, (2) the graduate student would have done his homework before communicating with the professor, and (3) the consulting professor would have received advance materials to make such ECS conference meaningful.

4. Purpose of Communication: Access to Library or Reference Services at Distant Institution

(The "questions" referred to in the table below are those in the standard evaluation form used by all faculty participants, i.e.,)

Question 2 "To what extent do you feel personally concerned with the problem?"

Question 3 "Among your colleagues, to what extent would the stated problem be a recognized concern?"

Question 5 "To what extent will the proposed actions resolve the stated problems?"

Question 6 "To what extent would you personally wish to see the proposed actions undertaken?"

Question 7 "Among your campus colleagues, to what extent would the proposed actions be supported and encouraged?"

Access to Reference Services

A. No. of Proposals	B. No. of proposals with mean of 2.0 or higher for questions "2" & "3" together	C. Percentage (B. of A.)
26	21	81%

D. No. proposals in B. with mean of 2.0 or higher for questions "5, "6" & "7" together	E. Percentage (D. of B.)	F. Mean rating of questions "5", "6" & "7" in D.
19	90%	2.7

With the increased output on the part of researchers and writers and the improved facility for printing, the library, which is the most common storage and retrieval system, is rapidly being inundated on all university campuses. No longer can anyone afford the acquisition or the storage space for broad holdings in very many areas. Many librarians and academicians are looking toward the day when this sort of material can be stored in electronic systems, easily retrievable and available to distant points. The computer is basically the key here, and it is looked upon by many as a panacea to this problem. Experience has shown that this is undoubtedly not true. But the computer in conjunction with other forms of electronic and microform storage devices will provide an answer to this problem in the years to come. In the ultimate system, this material should be available at the faculty member's or the administrator's desk for instant recall. Such a system will not be in general use for many years, but there are many interim stages that can be and are being explored at this time. They go at least part of the way toward solving the immediate problem and perhaps point the way toward the ultimate solution.

Several proposals were offered which were applicable to a number of subject matter areas. However, there were a number offered that applied only to one or two disciplines at most.

The most comprehensive proposal submitted in this general category called for a complete regional service which would be available to all faculty on all CIC campuses at all times (Proposal No. 164). A computer center at each CIC campus would provide local campus service and also would be on line to a CIC Central Computer complex. Reference materials would be made available to the inquiring professor in the form of print-out, TV display, electrostatic hard-copy, etc. The author frankly admitted serious gaps in the proposal but offered it in the realization that nearly all the technology called for by the proposal is now available and that such a service would be of infinite help to faculty members engaged in research and other scholarly pursuits. It is interesting to see how this proposal was received.

Rating it rather high were: biology, geology, pharmacy and veterinary science. Evaluations indicating less enthusiasm came from mathematics, the computer sciences, libraries and A-V departments. However, throughout all the subject matter areas, none rated the proposal low.

Other proposals offered might be summarized this way:

1. ECS link with computer-stored financial information in Manhattan.
2. Access to Engineering Society Library Index
3. Access to the inter-university consortium for international studies at the University of Michigan.
4. The development and operation of a computerized law library.
5. Access via slow-scan TV to Mathematics Abstracts.
6. Access to Chemical Abstracts in Columbus, Ohio.
7. Physicists' access to Project TIP at MIT.
8. Access to the Center for Research Libraries in Chicago by CIC librarians.
9. The establishment of a CIC clearing house for interlibrary loans in Washington, D.C.
10. Access to Thermophysical Properties Research Center at Purdue.

In only isolated instances did any of the proposals receive "low" ratings. Comments accompanying evaluation sheets can be characterized generally as being in sympathy with the stated problem. Many pointed out, however, the vast amount of planning that would be required to institute rapid interinstitutional storage and retrieval services.

A great amount of discussion has been carried on within the CIC between ECS personnel and computer center directors relative to the way ECS could provide logical extensions to current computer operations. Indeed, many networking ideas have as their main thrust, the tieing together of computers for research, storage and retrieval functions etc. As recounted above, response to proposals of ECS use involving computers has been generally favorable. However, a problem has surfaced which seems to be universal among all CIC computer centers and which ECS staff-members felt the need to probe. The rapid growth of local operations and the dynamics of this relatively young science appear to keep local directors extremely busy taking care of their own houses. Although they see the potential and the advantages of interinstitutional link-ups, many center directors feel they cannot afford the luxury of thinking beyond the next generation of equipment which is needed now to satisfy local, ongoing needs.

The occasional meetings between computer center personnel appear to be confined to trouble-shooting each other's local problems. Although machine incompatibility is no longer a major problem, procedures and administrative responsibilities appear to be widely diverse from campus to campus.

In order to focus on realities and to avoid, if possible, all vestiges of "blue-sky" generalities, the ECS-CIC staff with the help of Gerald Weeg, Director of the University of Iowa's Computer Center, developed and distributed to all Computer Center Directors of CIC institutions a survey questionaire. The questionaire confined itself to practical questions of local capabilities, service loads and future plans.

The original questionnaire and a subsequent reminder has netted responses from five of the eleven institutions. The return of less than 50%, coupled with some incomplete answers on questionnaires which were returned would make any detailed analysis or interpretation of rather questionable significance.

However, some assumptions can be made from the manner in which the five respondents answered certain selected questions.

Question 1: Would your installation have a need for computer time at other centers to relieve peak load situations?

Yes	No
Iowa	Chicago
Northwestern	Illinois
	Minnesota

Question 2: Does your installation normally have computer time available which could be used by other CIC institutions?

Yes	Hrs. per day	Time of day	Regularly
Chicago	7	night	No
Iowa	2	third shift	No
Northwestern	2-3	third shift	No

No
Illinois
Minnesota

Question 3: Can your computer system accomodate remote input?

Yes		No
Chicago	Tape to tape rate	Minnesota
	Tape to disk rate	Iowa
Illinois	14.8 LPS	Northwestern

Question 4: Do you have special computer programs which can be made available to other CIC institutions working your computer?

Yes	No
Chicago	Illinois
Northwestern	
Iowa	
Minnesota	

Question 5: Can a list of your computer programs be made available to other CIC institutions?

Yes	No
Chicago	Illinois
Iowa	
Northwestern	
Minnesota	

Question 7: Do you plan to buy or rent additional computers?

Yes	When	No
Chicago		Northwestern
Illinois	3/67	
Iowa	12/66	
Minnesota	12/66	

Question 8 : Is your present computer available on a time sharing basis with remote slow speed teletype stations in various buildings over the campus?

Yes	Stations	Bldg.	No
Illinois	1	1	Chicago
			Iowa
			Northwestern
			Minnesota

Do you plan to add time sharing facilities with your next generation of equipment?

Yes	How many stations?	Bldgs.	No
Chicago	18	3	Illinois
Iowa	40	20	Minnesota
Northwestern	?	?	

Could other CIC institutions be regularly considered as remote slow speed teletype stations of your computer

Yes	No
Northwestern	Chicago
Iowa	Illinois
Minnesota	

Question 14: Would a regional ECS Computer Center with the biggest computer system available in a broadband time sharing configuration be helpful to your current or planned computer center?

Yes	No
Iowa	Chicago
	Illinois
	Minnesota

Question 15: Could you provide office space for an ECS Computer Center traffic manager?

Yes	No
Iowa	Chicago
	Illinois
	Minnesota

Other questions asked for listings of available computer programs or CAI programs, inventories of computer center equipment, tables of organization, hourly charges, etc. The completed questionnaire are available and on file at the ECS office at Purdue University. However, it would appear from the summary of answers included here that attitudes toward interinstitutional exchange of computer services vary widely among the institutions and that no clear pattern has emerged. It would seem that current practices do not include the concept of wide scale networking of computer facilities. Time sharing of computers definitely is growing on the individual campuses but need has not been evident for more than specialized or occasional link-ups between institutions.

Specific proposals for ECS use which would link the Midwest Model to the Educational Resources Model on the eastern seaboard were generated largely through the efforts of Harold Roeth, Associate Director of ECS for the Educational Resources Model. The potential service available is explored in much greater detail in that part of this report. However, some nine areas of concern considered proposals which included eastern resources. Generally speaking, acceptance could be rated as high.

The assumption can be made that once an ECS Midwest Model becomes operational, and faculty members realize through experience the communications possibilities, traffic between the midwest and the east would step up considerably. It is believed that the way will have to be shown during the pilot period, however, and experimental uses of the system between the two models will need to be arranged and demonstrated.

The same may be said for interinstitutional applications of computer assisted instruction. CAI is now demanding and receiving much attention on the part of all educators. Using many of the techniques delineated by programmed instruction and adding a few of its own due to the tremendous storage capacity of the computers, CAI seemingly has a great potential for "tutor-like" instruction. Like programmed instructions, computer assisted instruction has a voracious appetite for the time of the programmer. However, once a program is completed it can and should be shared with others in both local and remote locations. If there are satisfactory communication channels available, this can be accomplished. Then, because of the tremendous time requirement in constructing a CAI program, it seems logical to assume that centers for given academic areas will be established and their programs made available on a share-time basis with any other institution that can be put into communications with them.

One proposal dealing specifically with computer assisted instruction was distributed to six areas in the study. The proposal called for the cooperative development (via ECS) of CAI program centers in the CIC group of institutions. Theoretically, computer centers at different institutions would become repositories for CAI programs for particular subject-matter areas and through ECS facilities would be accessible to all institutions.

Only representatives of the engineering and institutional studies disciplines rated this proposal favorably. Much less enthusiastic were the evaluations from biology, psychology, computer and data processing centers, and libraries and AV centers. The critical comments accompanying evaluations might be summarized this way: "The proposal is much too optimistic about the acceptability of locally produced CAI programs in other institutions."

There are several faculty groups within the CIC making studies of CAI potentialities. ECS would appear to be an ideal vehicel to test applications which are interinstitutional in nature.

5. Purpose of Communication: Seminars and Colloquia

(The "questions" referred to in the table below are those in the standard form used by all faculty participants, i.e.)

Question 2	"To what extent do you feel personally concerned with the problem?"
Question 3	"Among your colleagues, to what extent would the stated problem be a recognized concern?"
Question 5	"To what extent will the proposed actions resolve the stated problems?"
Question 6	"To what extent would you personally wish to see the proposed actions undertaken?"
Question 7	"Among your campus colleagues, to what extent would the proposed actions be supported and encouraged?"

Seminars and Colloquia

A. No. of proposals	B. No. of proposals with mean of 2.0 or higher for questions "2" & "3" together	C. Percentage (B. of A.)
16	13	86%

D. No. of proposals in B. with mean of 2.0 or higher for quest. "5", "6" & 7 together	E. Percentage (D. of B.)	F. Mean rating of questions "5", "6" & "7" in D.
12	92%	2.6

Hundreds of seminars and colloquia are held on each of the CIC campuses annually. The Purdue campus alone holds at least 350 such meetings each year. A considerable sum is set aside by many departments to pay honoraria and travel to experts from other campuses and industry. Such presentations are often more limited by the availability of men than they are by funds.

It is therefore logical to assume that if such seminars could be shared through the services of an ECS, this development would be welcomed by both the presenters and the audiences. The presenters would not be called upon so often to take time away from their research/teaching/administrative activities. The audiences would have the opportunity to hear better informed people more often and people addressing themselves to more pertinent subject matter.

Faculty participants saw three potential ways in which ECS could be utilized to help with the colloquium/seminar problem. The first of these was to enable other universities to listen in on seminars held at one campus. The second idea was to utilize seminar presenters from their offices on their home campuses to make presentations to seminar groups on remote campuses. The third idea concerns the joint planning of seminars so that more important people could be involved and thus made available to all campuses by allowing a series of campuses to originate seminars in turn.

Several proposals for interinstitutional colloquia or seminars were suggested by faculty members and they received approval from most areas of interest covered in the study. Those areas indicating more favorable reaction to this use of ECS are:

Biology
Economics
Education
Graduate Schools
Health Sciences
Mathematics
Pharmacy
Speech

Less enthusiasm for this use of ECS were indicated in the responses from the following areas:

Astronomy
Engineering
Geology
Languages
Law

Respondents from psychology departments seemed to favor the idea of faculty colloquia, but seemed much less interested (or saw less value in) graduate student seminars conducted via ECS.

Responses are interpreted here as being influenced chiefly by the basic idea of colloquia, seminars and other types of structured scholarly dialogue. Responses are also influenced, perhaps to a lesser degree, by some of the organizational or mechanical aspects of the various proposals. Broadly interpreted, the colloquiumor seminar would convene monthly or bi-monthly for a period of about one and a half hours. Arrangements for each such meeting would be worked out in advance (via ECS) so that interinstitutional discussion could occur freely. Principal participants would be provided the necessary aids to enable them to display visual material or to make "chalkboard" types of notations.

Comments which were critical of this use of ECS, spoke of the "difficulty in getting faculty members to attend presently scheduled colloquia or seminars. Additional such meetings would compound the problem."

It would appear from the weight of the data, however, that faculty respondents felt that this basic use of the system would be helpful and should be pursued.

6. Purpose of Communication: Non-Teaching Services for Students

The "questions" referred to in the table below are those in the standard evaluation form used by all faculty participants, i.e.)

Question 2	"To what extent do you feel personally concerned with the problem?"
Question 3	"Among your colleagues, to what extent would the stated problem be a recognized concern?"
Question 5	"To what extent will the proposed actions resolve the stated problems?"
Question 6	"To what extent would you personally wish to see the proposed actions undertaken?"
Question 7	"Among your campus colleagues, to what extent would the proposed actions be supported and encouraged?"

Non-Teaching Services for Students

A. No. of proposals	B. No. of proposals with mean of 2.0 or higher for quest. "2" & "3" together	C. Percentage (B. of A.)
8	4	50%

D. No. of proposals in B. with mean of 2.0 or higher for quest. "5", "6", "7" together	E. Percentage (D. of B.)	F. Mean rating of question "5", "6", "7" in D.
2	50%	2.6

The need to provide opportunities for students to gain experience beyond local campus functions is recognized as one which universities have tried to meet.

As part of their total development, students need more opportunities to test their abilities among their contemporaries. The restrictions of time and money often prevent a great number of students from participating in activities which pit their skills and abilities against students from other institutions. Several proposals spoke to this question and suggested ways that ECS might assist.

Proposal No. 187 suggested that ECS could provide the means for much more interscholastic activity in the field of physical education. Competitive games, such as bowling, which do not require both teams to be in the same place, could be played simultaneously on local campuses with scores exchanged via ECS. Elaborations upon simple exchange of scores could include visual display of running scores, announcements by judges and other devices which would heighten the feeling of competition.

This proposal was rated very high by the physical education faculty who responded.

In the field of speech, a proposal which suggested that ECS could be used to conduct interscholastic debates did not meet with as much acceptance. In addition to the rather low rating given this proposal by the faculty members who responded, these comments were concluded: "debates require visual as well as audio presence"; "our debaters get all the travel and competition they need".

7. Purpose of Communication: Continuing Education and Public Service

The "questions" referred to in the table below are those in the standard evaluation form used by all faculty participants, i.e.,

Question 2	"To what extent do you feel personally concerned with the problem?"
Question 3	"Among your colleagues, to what extent would the stated problem be a recognized concern?"
Question 5	"To what extent will the proposed actions resolved the stated problems?"
Question 6	"To what extent would you personally wish to see the proposed actions undertaken?"
Question 7	"Among your campus colleagues, to what extent would the proposed actions be supported and encouraged?"

Continuing Education and Public Service

A. No. of proposals	B. No. proposals with mean of 2.0 or higher for quest. "2" & "3" together	C. Percentage (B. of A.)
7	4	57%

D. No. proposals in B with mean of 2.0 or higher for quest. "5", "6", "7" together	E. Percentage (D. of B.)	F. Mean rating of questions "5", "6", "7" in D.
3	75%	2.9

Universities and educational associations are accepting more responsibility each year in the area of continuing education. This need is met most commonly today by holding workshops, conventions, or conferences. The growth of this type of activity indicates that it fills a need and involves a great number of faculty members. Organizational logistics require great amounts of the administrator's time, and they place inordinate demands upon the authorities in the field. Hence, there is a continuing search for ways to enlarge the audiences and reduce the incidence of participation by the authorities. A communications system is envisioned as providing the following opportunities to alleviate these problems:

1. Expanding the audience by making the audio and visual portion of the conferences available to persons in remote locations.

2. Providing for participation by the experts from remote locations, thus eliminating travel and cutting down on time away from regular duties.

3. Joint planning of such activities so that they can be shared by all.

A glance at any list of such activities reveals that work is going on in professional, sub-professional, pre-professional and re-training areas.

The application of ECS to the broad activity of continuing education was considered in one basic proposal for use (proposal 174). Generally speaking, the proposal suggested that guest speakers could be brought to local continuing education conferences via ECS, or alternatively, that professional groups on several campuses, through electronic inter-connection, could share presentations. Telelecture techniques, with provision for transmission of visual materials, chalkboard notations (electrowriter) and two-way audio were suggested.

The proposal, which further suggested that ECS facilities would be used for the coordination and planning of such inter-institutional activities, was distributed to faculty members in:

The Health-Sciences	Veterinary Science
Law	Extension Division
Pharmacy	

Data indicates that all areas except law would find such use of ECS very acceptable.

8 Purpose of Communication: Radio Broadcasting

Active cooperation and communication between educational broadcasters preceeded by many years the formation of the CIC. However, the institutions in the CIC group were early and leading exponents of educational broadcasting as a means of fulfilling their obligations to citizens "who cannot come to the campus". Seven of the eleven institutions have operated AM radio stations since the early 1920's. Today the CIC universities operate seventeen FM stations, four TV stations, six TV production centers, one radio production center in addition to the original seven AM stations.

One of the continuing concerns of the CIC broadcasters has been the establishment and operation of a "live", regional network as a means to upgrade programming and improve public services. This networking concept fits perfectly the raison d'etre of the CIC and ECS, i.e., improvement of quality through sharing of resources. Services have been improved considerably in recent years through the growing strength of the National Association of Educational Broadcasters, the professional association to which all CIC broadcasting operations belong. The National Educational Radio Network of the NAEB provides high quality tape-recorded programs and other services for its more than 150 affiliates on a self-supporting basis. The logical next step for CIC broadcast operations continues to be "live" interconnection.

In 1961, through a grant provided by the CIC, Carl Menzer, General Manager of WSUI, Iowa City, Iowa, conducted an exhaustive survey among the member institutions and their broadcast arms to determine the feasibility of a network, its technical configuration, its programming potential and the economic implications of operation.

The resulting study revealed high interest among the member universities, ample evidence of cooperative programming possibilities and resulted in a relatively simple plan for a "round-robin" interconnection system. Although the estimated cost to establish and operate the proposed network was low when measured by commercial standards, the decision to implement the plan was deferred in favor of other programs considered by the CIC to have higher priority.

The current ECS concept of interconnection now affords the opportunity to establish a regional radio network which would share transmission facilities with the non-broadcast services of ECS.

Two specific proposals related to networking were sent to all radio broadcast managers in the CIC institutions. One called for a central production center charged with the production of high quality network fare which could be utilized by all stations on a CIC network (Proposal 29).

The other proposal requested responses from the broadcasters regarding actual programming they would prefer and possibly help to provide on a "live" radio network (Proposal 253).

The general response to both proposals was very favorable. Radio operators, in their selection of programming preferences, set valuable guidelines for a future network schedule. In addition all of them indicated that their production services could contribute programs and thus share in the responsibility of network operation.

A meeting of CIC radio broadcast managers held in Chicago on May 27, 1966, confirmed the continuing high level of interest in and the desirability for educational radio networking. Several aspects of a radio network operation were drawn into sharper focus.

The discussion may be summarized in the following areas of general consensus:

1. Initial network operation of about 21 hours a week, seven days a week.

2. A network could perform the additional unique service of extending individual station's broadcast day by offering early morning (prior to present sign-on times) and late evening fare (after present sign-off times). Each net affiliate would agree to program the network in turn for these periods.

3. CIC stations would expect to contribute up to $100,000 to a program production fund for the ECS pilot period and would assume that matching funds would be sought. (The proposal for a Production Center for the pilot period was deferred and the concept of awarding separate production contracts to existing production centers within the CIC or elsewhere was substituted.)

4. Each CIC radio manager could assign a staff member to full-time network programming in a particular area of interest.

5. Each CIC radio manager would identify outstanding specialists or scholars on his campus who might be called upon as program talent and/or resource persons.

6. ECS narrow-band services could materially help local and network management personnel in a variety of ways, e.g., storage and retrieval of music library file information.

In view of No. 5 above, CIC radio managers have provided the ECS staff with the names and professional background data of faculty members (Appendix J) who could act as resource persons in the following very general fields:

1. Agriculture
2. Business/Economics
3. Education
4. Engineering
5. Fine Arts
6. Law
7. Literature
8. Medical Sciences
9. Music
10. News/Comment
11. Science
12. Social Sciences

The 1961 Network Study conducted by Carl Menzer, General Manager of WSUI (University of Iowa) contained the following summary in its report.

"In summary it can be reported that to organize and operate a midwestern radio network of CIC institutions is a thoroughly practical project.

It will provide programming facilities far superior to those that could be obtained by any individual station.

It will tend to raise the quality of production and the scope of efforts at the several institutions.

It will provide closer institutional contact over the major portion of seven states and thirty-eight million people, and project the image of higher education over this area and to these people.

It will provide this huge area with a service far superior to anything before available in fields of education, culture and information, and not generally available elsewhere.

It will pioneer in forming a nucleus on which to build a nationwide educational service.

It will allow experimentation to determine the value of using an expert, available at only one place, to provide material to others in the instructional program.

It will provide a research tool to determine the value of radio as an inexpensive means (contrasted to highly expensive television) of providing classroom and adult off-campus instruction.

It has the wholehearted support of all individuals and organizations engaged in the educational broadcasting field.

It will provide closed circuit facilities for the eleven institutions which can become a most important and money saving device.

It will assist the educational institutions in discharging their responsibilities to the citizens of this area who cannot come to the campus, and at relatively little expense.

It will provide an opportunity for acquiring experience in network operation, looking forward to the time when it may become feasible to inaugurate television networks.

It will provide an opportunity for the training of students in network operation not now available.

It will give stature and national recognition to the radio operations involved.

Further: This project meets the goals of CIC to improve educational and public services while minimizing costs by (1) instituting cooperative efforts among the eleven institutions, (2) identifying specialized areas of teaching and research in which cooperative arrangements may be desirable, and (3) initiating cooperative activities in instruction and research, particularly in graduate areas, among the institutions.

It will do these things and many more. The cost, compared to other projects of similar importance, is low. The technical facilities, programming and manpower are presently available. There need be no substantial delay."

The current ECS study on interconnection of CIC institutions appears to support the 1961 summary statement completely, adding the factors of shared network facilities with non-broadcast functions and the option of television interconnection as well.

RECOMMENDATIONS

Administrative Design

Managing the Project

The ECS Project is in the forefront of electronic interuniversity communications networks, a new concept whereby the faculties and administrations of institutions of higher learning recognize that they no longer can be self-sufficient but must of necessity depend upon colleagues in other institutions for a part of their ideas and a part of the storage and retrieval of the information they need to carry out their assigned tasks.

Along with this awakening, there has been an on-campus awakening in many of the CIC institutions and elsewhere to the needs for a new type of specialist to help with the ever changing job of instruction and research. This new type has a whole host of names. He is called a "media specialist" with the title of "director of communications", he may direct a "center for learning" or he may carry many other titles. He is a service function but with a new approach.

In the history of colleges and universities in the United States there has been a continuum of relationships between faculty and administration. At one end of this continuum is the faculty dominated institution whereby all matters are left in the hands of the faculty, and the administration has only the task of providing sufficient funds to allow the faculty members to carry out the tasks they determine to do. At the other end of the continuum is the administration dominated institution wherein the administration determines what the faculty shall do and provides them only the dollars to do those tasks. Undoubtedly, there are no examples of the extremes of this continuum, but it is readily apparent that there are many, many points on the continuum at which institutions fall, and it is unlikely that any two institutions fall exactly at the same point.

In many institutions there has grown up a group of "service" departments or organizations. The most common of these is the Physical Plant. In more recent years universities have determined that there are certain service functions which they can perform for themselves although in the past they may have been done by independent contractors. The most common of these is printing. In both of these instances, however, the client-agency role has been played to a greater or lesser degree. In other words, the department or school requests that certain services be performed and the agency performs these services to the best of its ability. Consultation is called for and advice is often given but, essentially, the relationship is that of a buyer and a seller. If the department has the money, the agency will normally perform the task although it may not agree with the methods prescribed or that the outcome is appropriate.

The new type of specialist mentioned above does more than the typical "service" worker. These are professional people in the academic sense of the word, schooled both in educational methodology and in educational technology. In addition they have an evangelistic function to perform. They go out and find uses for their service agency. They not only find uses, but they consult at a coequal level with the faculty on which functions of the service agency should be employed to allow the faculty members to reach their goals. It is at this unique functioning level, therefore, that we see ECS as a supra-service agency being developed.

The local campus director of ECS must of necessity become thoroughly familiar with the educational-technology hardware with which he works, but at the same time, he must be a developer who, on his own initiative, attempts to secure uses of the system by the faculty of his institution. He takes his lesson from many sources: the salesman, the association executive, the educational innovator and many others.

We see the ECS campus director becoming thoroughly involved in campus development. He must understand the administration of his campus. He must know how various deans work, what the role of the department head is, how the school faculty or the university faculty operate. He must understand the politics of the institution. He must know what educational work secures support readily and what does not. He must know the campus leaders and opinion makers, those whose judgment is respected, and he must be ready to involve these people in order that others may follow.

Undoubtedly, he will utilize the telephone, make personal visitations, and take opportunities to address large and small staff gatherings. He will have regular mailings: perhaps a general newsletter to some groups and specialized mailings concerning the interests of other selected individuals.

He will not work in isolation, for the ECS system will be utilized at least half an hour daily for conference calls between ECS directors who will discuss and outline how each of them is handling specific problems. They will also discuss what subject matter areas are seemingly the most interested in ECS and thus what areas he might best work in. Methodology of approach will also be a prime subject for discussion among the ECS directors.

He undoubtedly will build up a file card system so that he can, when talking on his own telephone in his own office to other ECS directors, pass along information about who is, for example, the most interested micro-biologist on his campus when the discussion gets around to biologists' communication requirements. He will exchange via slow-scan television, facsimile, or the mail detailed case histories, newspaper articles, magazine sections, or advertising literature, all of which he can utilize during personal visitations or as special mail pieces to interested faculty members.

He will be very aware of the radio, television, motion picture and audio-visual users on his campus. He will maintain a constant liaison with the people directing these activities and will be ready when called upon by faculty members to discuss and suggest ways that these local supra-service agency people can be contacted and approached. He will, of course, maintain a close liaison with the administration, both academic and fiscal, so that he is aware of the desires and plans for the development of all of the forms of communications on his campus.

He must also act as the interface with the communications technicians. In other words, he needs to know what services can be provided by the local telephone company, under what rules they operate with the local institution, and what intra-campus services they offer so that he can improve the local use of the telephone as well as the inter-campus use.

In addition to all of the above functions, he must perform the normal functions of a department or section head. He, of course, must hire the people who will work with him i.e. the local technicians and clerical staff. He must direct their operations, supervise their work and be certain that his local system does work in the way it's supposed to.

He must maintain the local schedules and be certain that they are met. He must keep the required financial records and file these promptly with the ECS-CIC director. He must assure the continuance of local housing and supplies.

He must maintain adequate liaison with the local CIC representative and with the local campus business office to be certain that these people are aware of his activities and that they receive regular reports of them.

The ECS local campus directors work with the CIC-ECS director to whom they report. The CIC-ECS director must be thoroughly aware of local conditions on all of the CIC campuses and must be in a position to provide leadership and ideas to the ECS local campus directors as well as providing a liaison with non-CIC universities so that ideas generated elsewhere can be integrated into the CIC system.

The ECS-CIC director must at the same time provide the financial reporting to the CIC as a body and must maintain liaison with the administration and financial officers on the campus on which he is housed. He must provide the proper coordination of schedules and maintain the central switching facility and any normal central office functions.

He must be responsible for final approval of all individuals hired by local campus ECS directors and, at the same time, he must be responsible for hiring a chief engineer for the system and the necessary clerks, telephone operators, etc. to maintain the central office function.

He, of course, must maintain a liaison with the overall ECS developments so that interconnection between the various pilot models can be readily established and the exchange of information can flow smoothly.

We believe these functions can be performed by the following people at or about the level of support indicated.

Central Office

The Central Office would be manned by five full-time people: a director, a chief engineer, a traffic clerk/secretary, and two full-time operators. There will be need for extra labor.

An annual budget follows:

Director	$13,000
Chief Engineer	11,000
Traffic/Secretary	5,000
Two Operators	5,000
Extra Labor	4,000
Supplies and Expenses (Including travel, telephone & normal office supplies)	5,000
TOTAL:	$43,000

Following are job descriptions of the individuals called for above.

A. Director

1. Supervise all operations.
2. In cooperation with the Local Office Directors and with approval of CIC and NAEB/ECS establish and enunciate policy.
3. Make schedules for both programming and switching.
4. Be responsible for relations with the CIC committee or supervisor.
5. Be responsible for relations with the NAEB or the contractor.
6. Be responsible for hiring the Central Office staff.
7. Recruit candidates for Local Office and Projects staffs.

8. Approve those hired for the Local Office and Projects staff.

9. Maintain a constant liaison with and supervision of Local Offices and Project Offices.

10. Make contracts or arrangements with the host institution for Local and Project Offices.

11. Establish relations with the host institution for the Central Office campus.

12. Make budget for the Central Office operation.

13. Approve budgets prepared for Local Office and Project Office operations.

14. Combine all budgets and secure approval of same from CIC committee and ECS Project Director.

15. Handle the distribution of all funds received from the appropriate sources.

16. Maintain appropriate liaison with common carriers.

17. Maintain a liaison with CIC/ECS Radio committees who sponsor projects.

B. Engineer

1. Supervise all technical matters throughout CIC/ECS.

2. Develop a technical policy in cooperation with engineers at Local Offices.

3. Make out the switching schedules.

4. Regularly inspect all Local facilities and consult with Local Office engineers.

5. Supervise the maintenance and repair of ECS/CIC owned equipment.

6. Recruit engineers and operators for Local and Central Office staff.

7. Approve the hiring of Local Office engineers.

8. Maintain appropriate liaison with the Telephone Company Engineering representative.

9. Act in the absence of the director.

C. Traffic clerk/Secretary

1. Make and distribute network program logs and switching logs.

2. Keep a record of requests and actions from all sources.

3. Keep the financial record for the ECS/CIC project.

4. Do secretarial work as required.

D. Operators

1. Be responsible for switching and monitoring as needed.

2. Do maintenance and repair work on ECS/CIC equipment.

E. Extra Labor

1. Weekend and other relief of operators and traffic clerk/secretary

F. Supplies and Expenses

1. Includes normal office supplies, travel, long distance, and technical supplies.

Local Office

Each of the 11 Local Offices would house a full-time director and full-time engineer with a part-time traffic clerk/secretary.

An annual budget for each local office follows:

Director	$10,000
Engineer	8,000
Traffic clerk/Secretary (half-time)	2,000
Extra Labor	3,000
Supplies and Expenses (including on-campus transportation)	3,000
TOTAL:	$26,000

Job descriptions of the local office personnel follows:

A. Director

1. Supervises local operation.

2. Helps develop network operating policies in cooperation with the ECS/CIC director.

3. Develops consistent local policy.

4. Maintains relations with the local CIC representative.

5. Makes the local budget.

6. Recruits the local engineer and traffic clerk/secretary.

7. Maintains day-to-day relations with the host institution.

8. Maintains day-to-day relations with the local Telephone Company representative.

9. Promotes the use of ECS on the local campus and arranges for the scheduling of local needs.

10. Arranges for local participation in ECS uses when these originate elsewhere.

B. Engineer

1. Helps develop the technical policy for the network in cooperation with the Chief Engineer.

2. Develops local technical policy consistent with the network technical operating policy.

3. Maintains and repairs local equipment.

4. Maintains liaison with the local Telephone Company engineering personnel.

5. Does local switching.

6. Responsible for transporting and installing ECS/CIC equipment on a temporary basis.

C. Traffic clerk/Secretary

1. Makes local schedules and distributes them.

2. Keeps the local financial record.

3. Performs normal secretarial and clerical functions.

4. Does switching and other minor technical operations as required.

D. Extra Labor

1. Manpower as needed to provide weekend and vacation relief for any member of the Local ECS Office.

E. Supplies and expenses

1. Normal office supplies, long distance, and travel.

2. Local transportation including the rental of necessary vehicles in cooperation with the host institution.

Summary of Administrative Design

A full-time central office staff would be maintained on one of the cooperating campuses. Individual ECS offices would be maintained on each of the cooperating campuses. Host institutions would be responsible for the provision of space including heat, light and power, to house all

ECS/CIC operations as their contribution to the project.

A summary of annual operating budgets follows:

Central Office staff	$ 43,000
Eleven local office staffs @ $26,000 each	286,000
TOTAL:	$329,000

System Operation

The ECS system will allow basically for three general types of communication.

1. Telephonic communications
2. Narrow band non-verbal communications
3. Broad band verbal or non-verbal communications

Under item 1 above, telephonic communications, the ultimate goal is to allow any professor on any CIC campus to dial any other professor on any other CIC campus. In its most usable form, this would mean that a professor on one campus could, by dialing a three digit code on his phone, secure the dial tone on any other campus, following which he would then dial the normal four digit extension number of the professor he wanted to reach. When not familiar with the numbers at the remote campus, he could dial a four digit code on his own campus, reach the local ECS office and there obtain the number of the party he wished to reach on the remote campus. If the number was not available it would then be possible to reach the operator at the remote campus by again dialing the three digit code and then the operator single digit number at that campus. Professors would, of course, over the months of operation maintain their own private listing of numbers of counterpart professors with whom they converse regularly.

By following this same procedure and using an instrument labeled chairman's control console, the chairman or originator or organizer of any conference call could dial directly the people who were to participate in the conference call, place them sequentially on a hold position, and then by opening the switches, put them all on the line at the same time. This would be further automated by use of a pre-punched tape or card dialer.

For Item 2 above, the same sort of direct distance dialing system would be utilized working this time through a universal data set to which any of the non-verbal transmission equipment could be attached. Thus, if a professor wished to converse with a colleague at a remote institution he would dial on his standard dial telephone the three digit code, and then the four digit extension number and make contact with the remote professor. Laying the phone aside then, he would go to the data set and using the dial there would use the three digit code to reach the remote campus and again the four digit extension number that would be tied to the non-verbal equipment in the remote professor's office and once this contact was made, throw a switch and have the non-verbal equipment ready to use. Returning then to his regular desk telephone he would carry on whatever verbal conversations he wanted and when the time came he would be able to transmit a picture by slow-scan or facsimile or to use the eléctro-writer for the exchange of blackboard type material, or use a teletype so that print material of this kind could be exchanged. Thus, the professor would have not only verbal communications but also the non-verbal communication paths established through the normal dial telephone procedure.

Again, using a chairman's control console, similar arrangements for the transmission of non-verbal material could be made with several professors at several remote campuses using the procedures outlined immediately above.

Item 3, verbal and non-verbal broad-band material would be transmitted on a pre-arranged scheduled basis with switching operations performed at both the local and the system ECS-CIC offices. Thus, at the prescribed time, switches would be thrown in each of the offices to be interconnected and in the central ECS-CIC office through a cross-bar switcher in that central office to allow for such broad-band interconnection. At this stage, FM radio material, medium-speed data material or long distance Xerox-type material could be put on the line and transmitted to or received by one or all of the remote locations.

By adopting the broader of the two technical designs to follow, universities would also provide themselves with television and high speed data transmission.

Little has been said about the number and types of non-verbal equipment that would be required on each campus. Certainly the wise way to start would be to arrange for each campus to have at least one of the various types of equipment currently available. It is presupposed that this equipment is portable, can be moved from point to point, or can utilize other distribution systems to get its output to various places.

INTERCONNECTIONS BETWEEN CIC-ECS AND OREGON ECS AND RESOURCE MODEL ECS

It is currently believed that interconnection should be made between the switching center for CIC-ECS and the switching center for ECS Resource Model. While it is not anticipated that direct dialing would be possible from any of the campuses of the CIC to locations within the ECS Resource Model, nevertheless it would be possible, working through an operator either at the ECS-CIC or the ECS-Resource Model center, to effect such a connection. Thus, by going to a little more trouble, the professors on the CIC campuses could talk and exchange information with others in the cities of Boston, Philadelphia, New York and Washington.

It is also anticipated that there would be an interconnection available -- at least part-time -- between the CIC-ECS central and the Oregon ECS central. Some of the functions of the CIC-ECS central would be to connect Oregon to the ECS Resources model central. Others would be to allow communication between CIC members and the Oregon model. Inasmuch as little is known of the amount of conversation or use that would be made of such a system, it is anticipated that two or three lines should be placed in operation on a direct order basis several hours each working day.

CONCLUSION

The ECS-CIC portion of this study has attempted through an involvement of 371 faculty members of the eleven institutions of the CIC to determine what ideas these individuals have about an interuniversity communications system, and how they react to the ideas of others.

The eight year history of cooperation between the universities of the Council of Ten and the University of Chicago as managed through the Committee on Institutional Cooperation has provided us with a solid foundation on which to build. While this resulted in some imbalances in our research effort, it nevertheless allowed us to proceed farther and faster than would have otherwise been possible.

The research plan was simplicity itself, and the fact that 262 proposals were generated, 3161 separate copies of these proposals were mailed to the cooperating faculty members and 1904 response sheets covering these proposals were returned is evidence of the kind of cooperation that was obtained.

The further cooperation of Prof. Warren Seibert, Head of the Media Research Unit at Purdue, and one of his graduate students, Mr. Richard Klimosky, has been invaluable. Miss Carol Shelly, a programmer for the Purdue Computer Center, and Dr. S. N. Conte, the Director of that Center have given generously of their time and effort in writing the new program that was necessary for their computer to give us the tables in the RESULTS section.

The interpretation in the DISCUSSION section was, we believe, a useful attempt at organizing the mass of data obtained into a reasonable number of problem areas. We describe some problems facing universities in these selected areas in order that the reader would have a background against which to measure the results of the proposals. There are undoubtedly other problems facing universities and colleges today, but any list would certainly include those we have used.

The present areas were determined through procedures which involved faculty participants in the study. Their suggestions of communications uses and their evaluations of proposed uses for an interinstitutional communications system brought out the following areas of concern for priority attention:

1. Research activities
2. Administrative problems
3. Instruction
4. Access to library or reference services at distant institutions
5. Seminars and Colloquia
6. Non-teaching services for students
7. Continuing education and public service activities
8. Radio broadcasting

The attempt earlier in this section to describe more fully the management function of an Educational Communications System and then specifically how that system would work was necessary in order that the reader of this report could have a little of the flavor of the ideas and developments with which our group has wrestled throughout the year.

We believed in the summer of 1965 that universities and colleges were rapidly being forced into the development of an Educational Communications System. We now have talked ECS with hundreds of individuals; we now have discussed interinstitutional communications among ourselves and our immediate colleagues over countless hours; we now have studied the problem at great length; we now are more than ever convinced that such a system is inevitable in the development of higher education in these United States.

TECHNICAL DESIGN

FOR

INTERSTATE (MIDWEST) MODEL

EDUCATIONAL COMMUNICATIONS SYSTEM

William J. Kessler

SUMMARY

This report constitutes a translation of the educational requirements of the Interstate (Midwest) Model as defined by the Associate Directors of the Midwest Model, James S. Miles and John H. Glade, into practical hardware.

The report provides a description of two alternative communications networks interconnecting the eleven CIC institutions in the Midwest:

Network A is a medium-band multi-media communications service within the common-carrier concept based on the Telpak tariff structure.

Network B is a private wide-band microwave system providing all the services available with Network A without the time-sharing restrictions in addition to a high resolution television channel with accompanying program audio.

A comparison of costs of owning and operating the private wide-band microwave system versus the cost of the equivalent services leased from the common-carriers is presented at the end of this section.

NETWORK A

OUTLINE OF REQUIREMENTS

Network A constitutes a flexible electronic communications system interconnecting the eleven CIC institutions. These institutions of higher education with the three-letter identifier code used in the attached drawings are:

Institutions	Location	Code
University of Chicago	Chicago, Illinois	(CGT)
University of Illinois	Urbana, Illinois	(URB)
Indiana University	Bloomington, Indiana	(BMT)
University of Iowa	Iowa City, Iowa	(IOC)
University of Michigan	Ann Arbor, Michigan	(ARB)
Michigan State University	East Lansing, Michigan	(LNS)
University of Minnesota	Minneapolis, Minnesota	(MNN)
Northwestern University	Evanston, Illinois	(EVS)
Ohio State University	Columbus, Ohio	(CLB)
Purdue University	Lafayette, Indiana	(LAF)
University of Wisconsin	Madison, Wisconsin	(MAD)

Functionally, the communications system proposed shall exhibit the following features:

I. Telephone/Narrow Band Data Transmission Service

(1) A twelve trunk telephone system, linking together the eleven CIC institutions, dedicated to the full-time use of the educational community on each campus. Any telephone subscriber set on any campus may dial any telephone on any other campus through a manually operated switchboard at the network Control Center to provide network control and coordination.

(2) The dial access and transmission switching facilities shall be such as to permit the interconnection of narrow-band analog or digital data devices on a time-shared basis with telephone service at the user's option. The narrow-band analog or digital data devices include (but are not restricted to):

a) Teletypewriters[1] with punched tape transmitter and receivers.

b) Slow-speed facsimile transmitters and receivers.

c) Electrowriter[1] type recievers.

These devices may be interfaced with the telephone line through a telephone sub set to provide dialing and signalling or a custom dial/signalling interface unit which forms an integral part of the data device. The Midwest Model Specifications also call for additional telephone lines on each campus terminating in "plug-in" type terminal blocks in selected offices (chairmen of each department for example) so that an existing campus telephone line is not pre-empted during those periods when the ECS data mode is in use.

II. Broadband/high-speed data transmission service. The flexibility of the communication system shall be such that the transmission facility may be converted into a wide-band analog or digital data transmission system as the educational requirements dictate.

III. The wide-band transmission facility described in II above shall be available conveniently at the user's option in place of, not in addition to, the telephone/narrow-band data facility described in I above.

INTERCAMPUS NETWORK FACILITY

The translation of the Educational Specifications of the Interstate (Midwest) Model into the engineering requirements discloses that the required interstate/intercampus telephone/narrow-band data network requirements can be achieved economically through the use of Telpak A, or the equivalent, offered by the common carriers. The intercampus telephone/data network proposed in this report therefore considers a full duplex Telpak A circuit or equivalent available between any two institutions at any time.

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[1] The terms "teletype" and "electrowriter" are proprietary terms belonging to the Teletype Corporation and the Victor Comptometer Corporation respectively. However, these terms are used in this report in a generic sense to represent similar devices of different manufacture in the interest of simplicity.

A Telpak A transmission facility is (compared to the common voice-grade telephone circuit) a relatively broad-band transmission circuit which can be subdivided (with suitable terminating equipment) to provide either:

a) 12 voice-grade telephone/narrow-band data circuits, or,

b) A single broad-band transmission facility.

It is important to recognize that the facilities/services stated in (a) and (b) above are available on an either/or but not both basis. It is these two choices available to the user as the educational communications requirements dictate which provide the flexibility demanded by the educational specifications.

The intercampus Telpak A facility provides full duplex service. That is: communications (broad-band as well as telephone/narrow-band data) in both directions simultaneously.

The continuous frequency range--or bandwidth--available through Telpak A in the broad-band mode with an A-1 Channel Termination is 20 kc/s. Since 48 kc/s of transmission spectrum is allocated by the common carriers for Telpak A, it is hoped that the telephone company can make available more efficient channel termination equipment which will make available to the user a larger percentage (40 to 45 kc/s) of the 48 kc/s spectrum space.

The facilities provided by Telpak A, B and C and the tariff structure as filed with the Federal Communications Commission and with the Public Utility Commission in most states of the U.S. between exchanges are as follows (as of August 1966):

Classification	Carrier Spectrum Assignment	Maximum Number Telephone Grade Channels	Per Airline Mile per Month
Telpak A	48 kc/s	12	$15.00
Telpak B	96 kc/s	24	20.00
Telpak C	240 kc/s	60	25.00
Telpak D	960 kc/s	240	45.00

Additional non-recurrent and recurrent termination charges per broad-band terminal and per telephone circuit are as follows:

Type of Service	Non-Recurrent Chg.	Recurrent Chg.
Telephone Grade	$10.00	$15.00/mo.
20 kc/s Broad-band	70.00	100.00/mo.

The educational specifications call for termination of intercampus facilities in terminal blocks or campus switchboards.

NETWORK SWITCHING AND CONTROL

An essential feature of the ECS communication facility is that control of the network configuration (that is, telephone/narrow-band data or broad-band data) and that communications tariff control be vested in one location to ensure good coordination and advantageous use of the built-in flexibility. This requirement introduces the concept of the ECS MASTER NETWORK SWITCHING AND CONTROL CENTER.

The NETWORK CONTROL CENTER, or NCC, may be located at the campus of one of the CIC institutions or at a convenient off-campus location. The requirement of convenience seems to dictate that the NCC be located on the campus of one of the CIC institutions.

Clearly, this choice will dictate the network configuration and the intercampus network mileage costs.

One of the simplest network configurations is a "Round-Robin" type of interconnection shown in Figure 1. This configuration exhibits two advantages and disadvantages which are immediately apparent. They are:

Advantages:

(a) Simplicity and lower interconnection costs due to reduced intercampus mileage.

(b) One degree of improved reliability due to provision of alternate routing of any one segment of the full duplex interconnection fails.

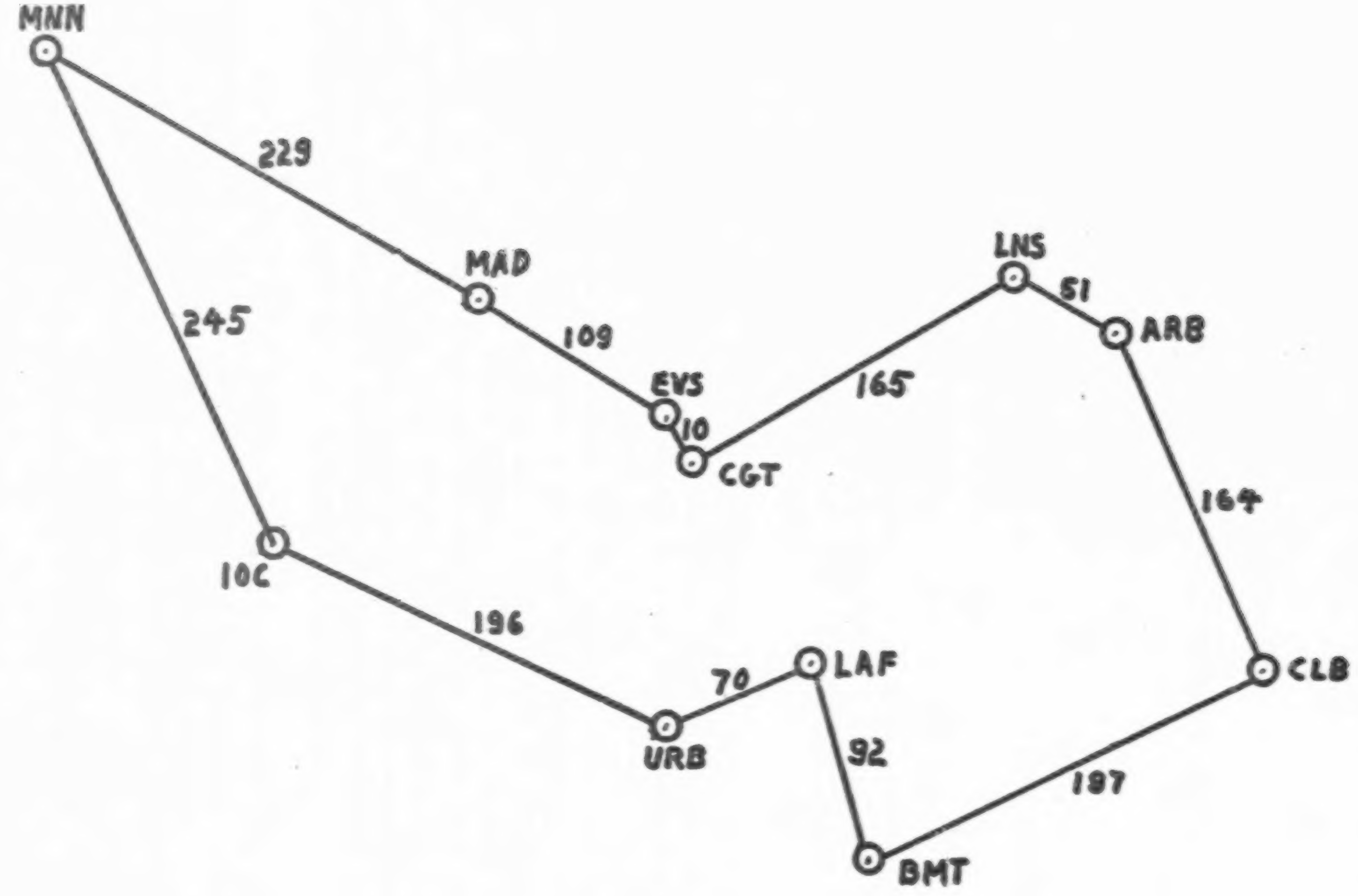

MNN
229
MAD
245
109
EVS
10
CGT
165
LNS
51
ARB
164
IOC
196
70
LAF
URB
92
197
CLB
BMT

FIGURE 1: ROUND ROBIN NETWORK CONFIGURATION

Disadvantages:

(a) Lack of flexibility. The assignment of any one segment to one of two possible network modes (telephone/NB Data or Broad-band Data) commits other campus terminals (which use the subject segment for network continuity) to the same mode if full duplex operation is desired.

(b) The difficulty of exercising network control from any one selected point without duplicating Telpak facilities along the "Round-Robin" route.

As a convenient (but arbitrary) reference, the total round-robin distance connecting all CIC institutions has been established at 1528 miles.

An equally simple, but more flexible and expensive, intercampus network configuration is a "Spoke" system in which the NCC is located ideally so that it forms a hub in the center of the network and the connecting links form radials or "spokes" to each campus.

A mileage chart can be constructed as shown in Figure 2 so that the total airline interconnection distances may be tabulated and compared with each of the CIC institutions serving as the hub. The chart discloses that the intercampus airline distance is a minimum if Chicago is selected as the location for the NCC. Such a network configuration with Telpak A circuits branching out from the NCC in Chicago to the remaining ten CIC institutions is shown in Figure 3. However, by taking advantage of the reduced rate per unit of bandwidth available with Telpak B and Telpak C by combining two or more Telpak A circuits along the same general direction into Telpak B or Telpak C circuits results in significant reductions in interconnection costs.

For example: The interconnection costs for the simple, but inflexible, round-robin configuration becomes: 1528 miles x $15.00/mile/mo.=$22,920/mo. for all eleven institutions. The monthly cost for the simple spoke system with Chicago as the NCC is:

1740 miles x $15.00/mile/mo. - $26,100/mo.

Combining Telpak A circuits into Telpak B and Telpak C circuits as shown in Figure 4 results in a monthly cost calculated as follows:

Total Telpak A Mileage

MAD - MNN = 229
MAD - IOC = 146
LNS - ARB = 50
LAF - CLL = 203
LAF - BMT = 92
LAF - URB = 70
= 792 miles

Total Telpak B Mileage

CGT - LNS = 165 miles

= 165 miles

Total Telpak C Mileage

CGT - LAF = 109
CGT - EVS = 10
EVS - MAD = 109
= 228 miles

TOTAL INTERCONNECTION COST

Telpak A at $15.00/mile/mo x 792 miles	= $11,905
Telpak B at $20.00/mile/mo x 165 miles	= 3,300
Telpak C at $25.00/mile/mo x 228 miles	= 5,657
TOTAL	$20,905/mo

Thus the network configuration of Figure 4 provides a saving over the configuration of Figure 3 of:

$26,100 - $20,905 = $5,195.00/mo.

Careful reference to the network configuration shown in Figure 4 reveals that the use of Telpak B and Telpak C provides the equivalent of a separate Telpak A circuit (the original requirement of the educational specifications) from the NCC to each campus plus the equivalent of two Telpak A as spares for future growth between EVS and MAD and one spare Telpak A each between CGT and EVS and CGT and LAF.

There may be reason to assume that educational and administrative factors may outweigh purely economic matters in selecting the best campus location for NCC. Figure 5 shows an alternative network configuration and monthly cost estimate obtained by applying the foregoing principles to a system in which the NCC is located on the Purdue campus in Lafayette, Indiana.

The monthly interconnection cost calculated as before becomes:

Total Telpak A Mileage

MAD - MNN = 229
MAD - IOC = 146
LAF - URB = 70
LAF - BMT = 92
LAF - CLB = 203
LNS - ARB = 51
= 791 miles

Total Telpak B Mileage

LAF - LNS = 196 miles

= 196 miles

Total Telpak C Mileage

LAF - CGT = 109
CGT - EVS = 10
EVS - MAD = 109
= 228 miles

TOTAL INTERCONNECTION COST

Telpak A at $15.00/mile/mo x 791 miles = $11,865
Telpak B at $20.00/mile/mo x 196 miles = 3,920
Telpak C at $25.00/mile/mo x 228 miles = 5,700

TOTAL . . . . = $21,485

or $21,485 - $20,905 = $580 per month additional. This is less than $53.00/mo. per institution. On a per-institution basis, the total interconnection cost of $21,485.00/mo. becomes:

$1953.18/per month per institution.

Each Telpak A circuit when utilized in the broad-band data

	Round Robin	MNN	IOC	URB	LAF	BMT	CLB	ARB	LNS	CGT	EVS	MAD
Minneapolis, Minn. (MNN)	0	0	245	415	450	525	620	510	455	347	340	229
Iowa City, Iowa (IOC)	245	245	0	196	250	310	450	394	360	195	193	146
Urbana, Ill. (URB)	196	415	196	0	70	112	272	241	269	121	130	206
Lafayette, Ind. (LAF)	70	450	250	70	0	92	203	203	196	109	120	222
Bloomington, Ind. (BMT)	92	525	310	112	92	0	197	261	270	198	209	310
Colombus, Ohio (CLB)	197	620	450	272	203	197	0	164	207	275	282	400
Ann Arbor, Mich. (ARB)	164	510	394	241	203	261	164	0	51	202	202	263
Lansing, Mich. (LNS)	51	455	360	269	196	270	207	51	0	165	168	241
Chicago, Ill. (CGT)	165	347	195	121	109	198	275	202	165	0	10	118
Evanston, Ill. (EVS)	10	340	193	130	120	209	282	202	168	10	0	109
Madison, Wisc. (MAD)	109	229	146	206	222	310	400	263	241	118	109	0
Minneapolis, Minn. (MNN)	229											
TOTALS	1528	4136	2739	2032	1915	2484	3070	2491	2382	1740	1763	2244

FIGURE 2: INTERCAMPUS MILEAGE CHART

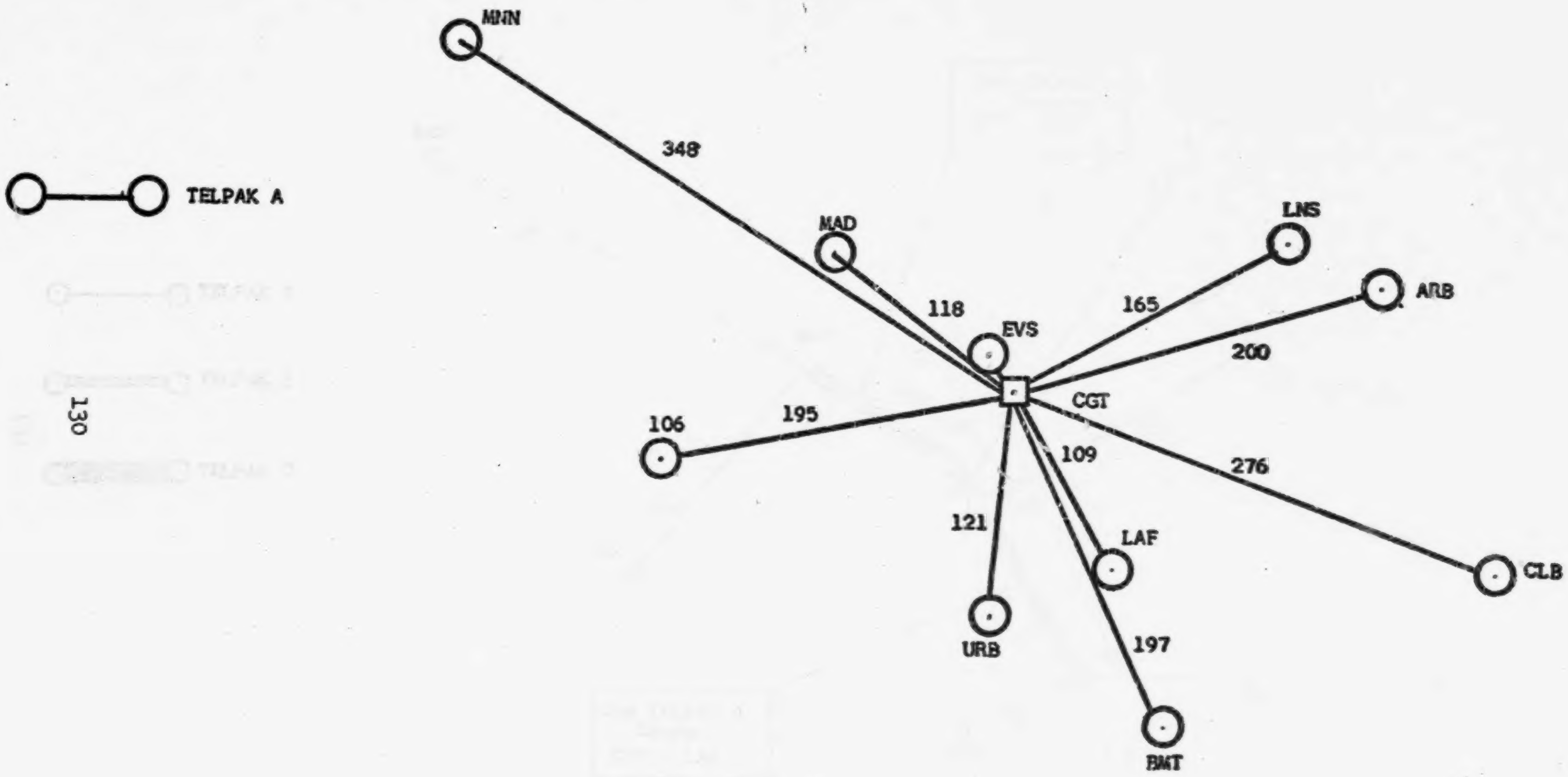

TELPAK A
MNN
348
MAD
118
EVS
LNS
165
ARB
200
CGT
106
195
109
276
121
LAF
CLB
URB
197
BMT

FIGURE 3: SIMPLE "SPOKE" CONFIGURATION

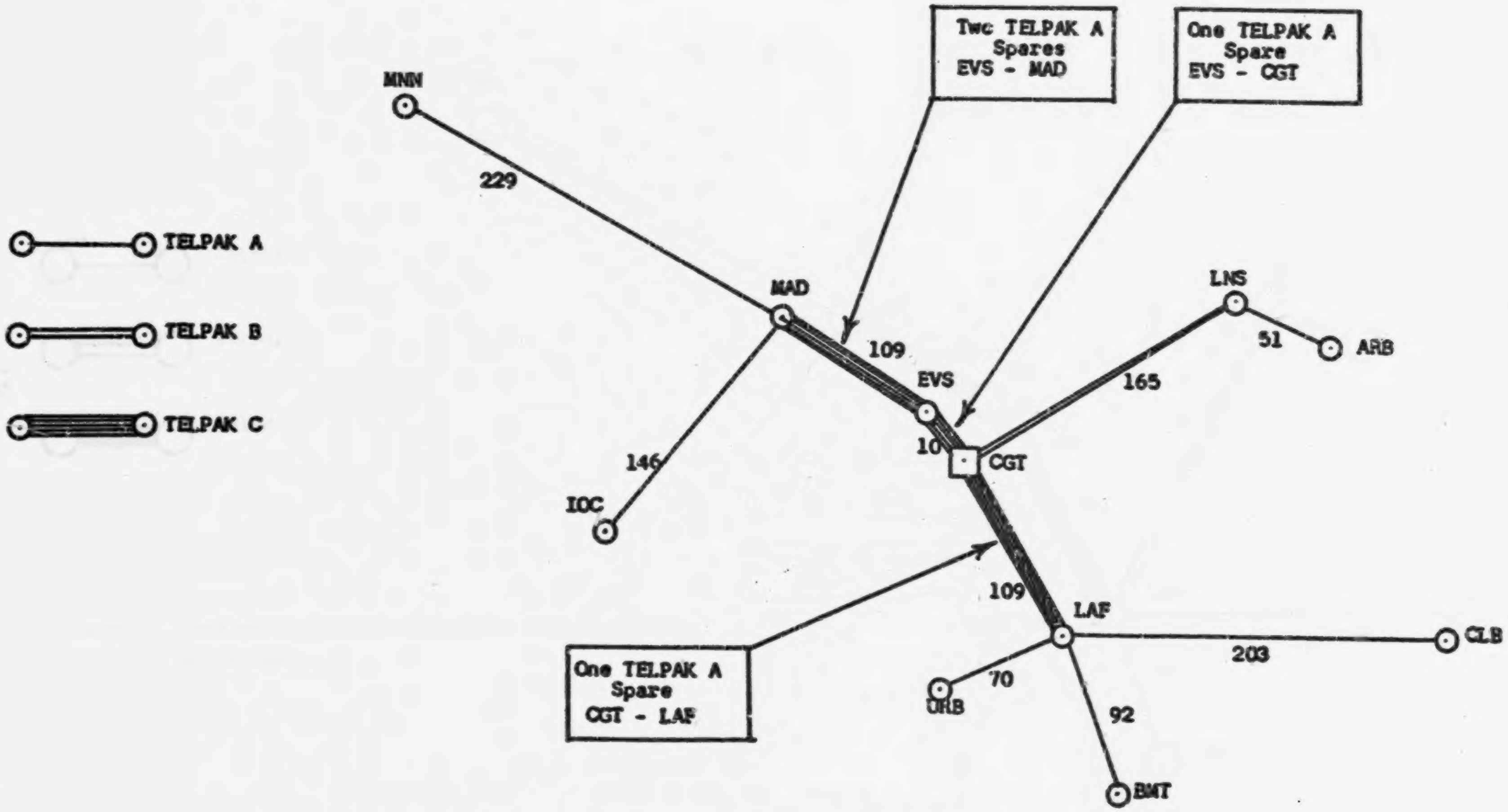

TELPAK A
TELPAK B
TELPAK C
MNN
229
MAD
146
IOC
109
EVS
10
CGT
165
LNS
51
ARB
109
LAF
203
CLB
70
URB
92
BMT
Two TELPAK A Spares EVS - MAD
One TELPAK A Spare EVS - CGT
One TELPAK A Spare CGT - LAF

FIGURE 4: DERIVED NETWORK CONFIGURATION WITH NET CONTROL IN CHICAGO

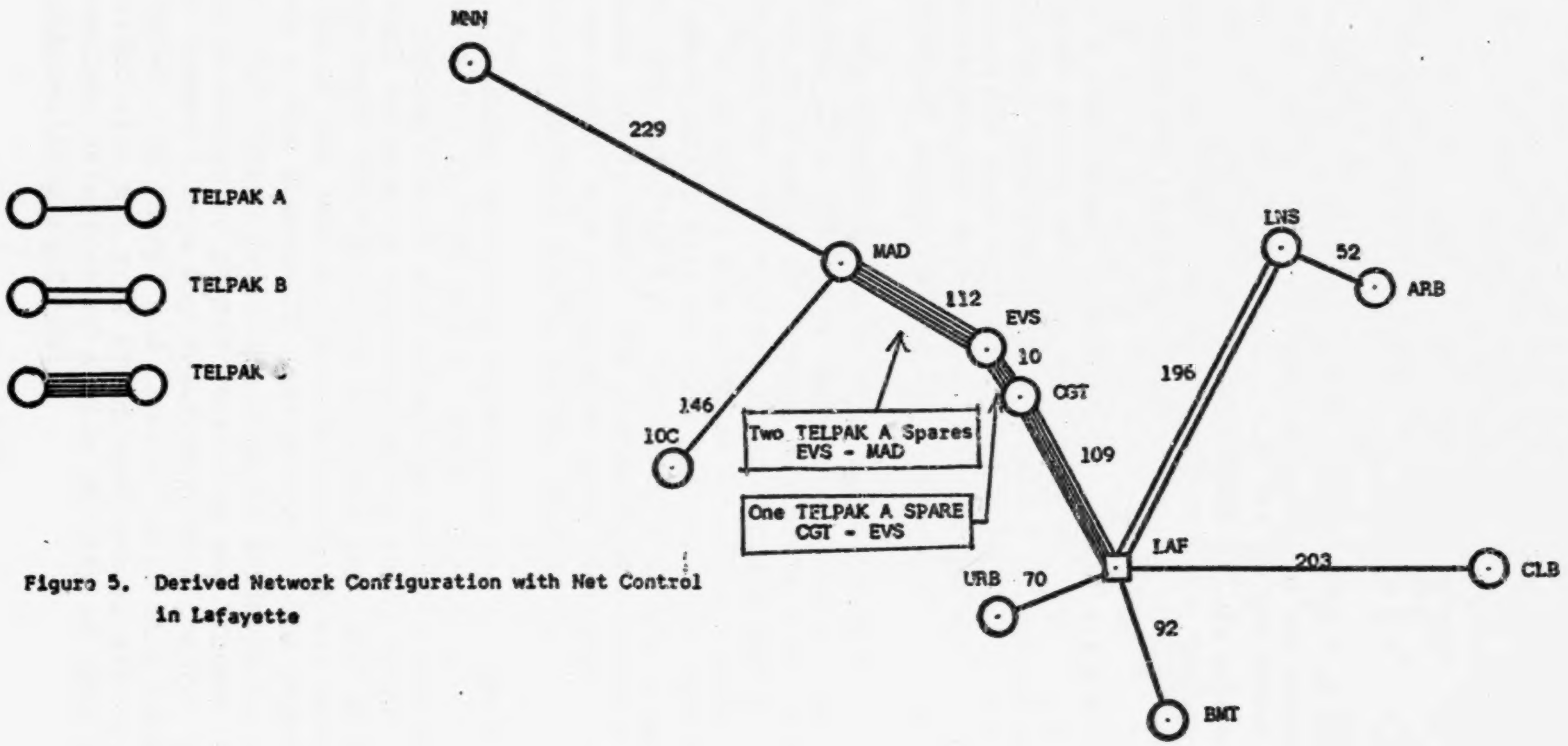

TELPAK A
TELPAK B
TELPAK
MNN
229
MAD
146
10C
112
EVS
10
CGT
Two TELPAK A Spares EVS - MAD
One TELPAK A SPARE CGT - EVS
109
LNS
52
ARB
196
LAF
203
CLB
URB
70
92
BMT

Figure 5. Derived Network Configuration with Net Control in Lafayette

mode is provided with one voice-grade telephone circuit for coordination purposes and is automatically switched with the broad-band channel.

THE NETWORK CONTROL CENTER

The primary function of the Network Control Center is to provide interinstitutional control and coordination of the communication facilities. Control of the interinstitutional trunk circuits may be accomplished by use of manual switchboard with enough operator positions to accommodate all of the interinstitutional trunk lines.

A functional "one-line" schematic diagram of a network control center is shown in Figure 6. Each line shown to the telephone switchboard is a Telpak A or equivalent connected to each CIC Institution divided into 12 voice quality/NB data telephone circuits. The exchange must therefore be capable of accommodating 11 x 12 or 132 trunks.

The broad-band switching facility shown in Figure 6 is a manual 12 x 12 matrix type crossbar switcher capable of switching signals up through a bandwidth of 10 megacycles (adequate for television) as in-surface against obsolescence. This is currently available as an off-the-shelf item of equipment which will provide simultaneous switching of the auxiliary supervisory voice circuit as the broad-band channel is switched. The pushbuttons corresponding to each "cross-point" are illuminated when depressed to provide in effect a network configuration "status board."

Crossbar switching represents the ultimate in switching flexibility in that any incoming circuit can be switched to any combination on all out-going circuits simultaneously as well as back to the originating point to provide a "loop-back" configuration suitable for testing purposes. Eleven of the twelve inputs and outputs are assigned as shown to the eleven CIC institutions. The remaining twelfth input and output switching bank is assigned to the network control center to permit receiving and transmitting ("drop" and "insert") from any broad-band data channel simultaneously. As shown, the "drop" and "insert" switching bands are each provided with a 1 x 12 broad-band manual switch to permit convenient selection of a wide variety of data interface and/or channelizing equipment.

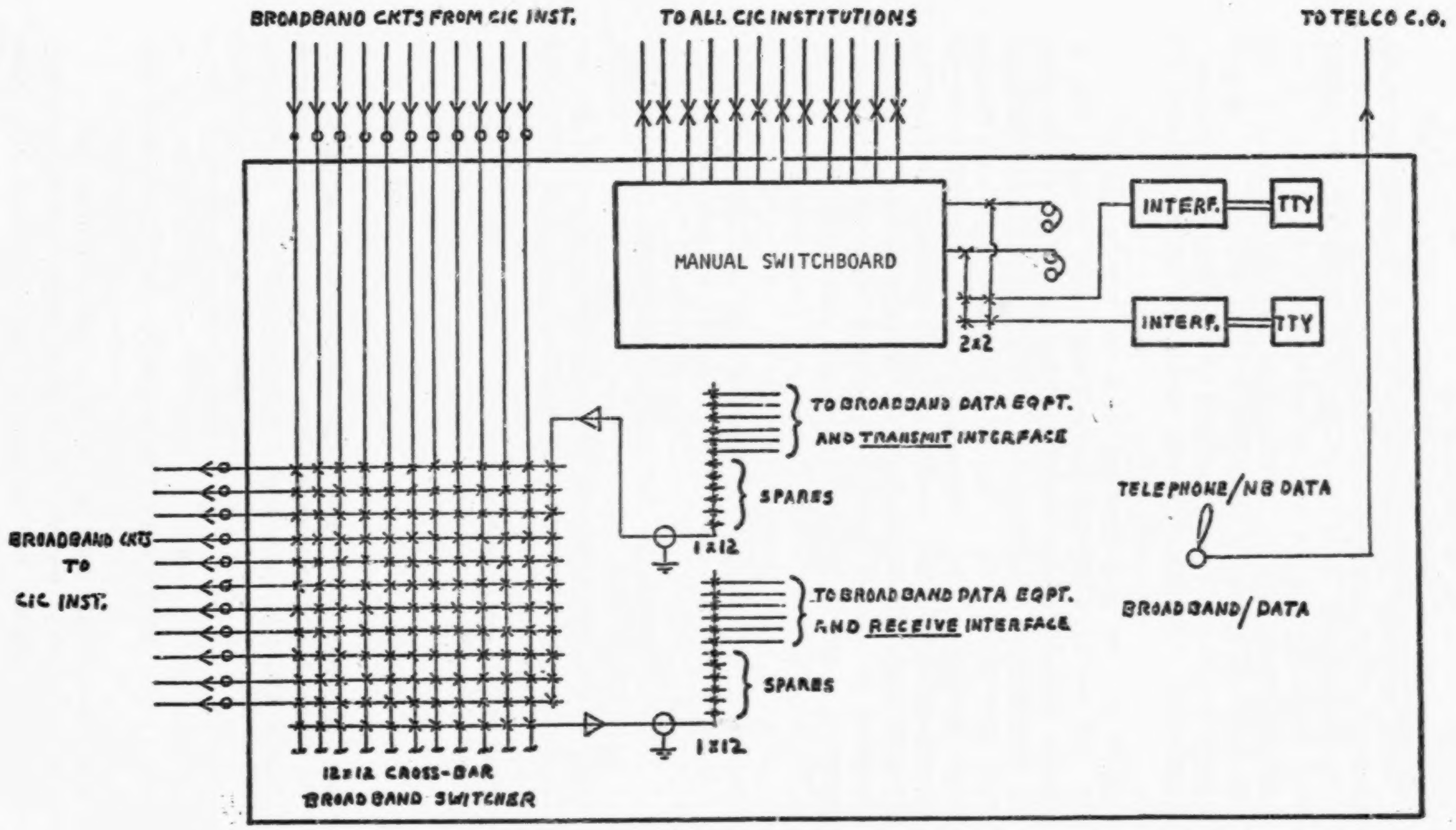

BROADBAND CKTS FROM CIC INST.
TO ALL CIC INSTITUTIONS
TO TELCO C.O.
MANUAL SWITCHBOARD
INTERF.
TTY
INTERF.
TTY
2x2
TO BROADBAND DATA EQPT.
AND TRANSMIT INTERFACE
SPARES
1x12
TELEPHONE/NB DATA
TO BROADBAND DATA EQPT.
AND RECEIVE INTERFACE
SPARES
1x12
BROADBAND/DATA
BROADBAND CKTS
TO
CIC INST.
12x12 CROSS-BAR
BROADBAND SWITCHER

FIGURE 6: MASTER NETWORK SWITCHING CONTROL CENTER

Each Telpak A circuit is provided with a two-position selector switch with a control line leading back to the Telc (central office) to permit convenient selection of the Telephone/NB Data or Wide-Band/Data transmission mode. A network mode selector switch is to be provided for each of the eleven Telpak A circuits although only one is shown in Figure 6. Again, the Telephone/NB data or Wide-Band/Data transmission modes are available on a shared time basis to be scheduled as required through the NCC Traffic Manager.

It should be emphasized that one of the significant objectives of the ECS Project is to provide for the termination of a single broad-band transmission facility into appropriate channelizing transmission equipment to be located at each campus terminal as well as the Network Control Center. In this manner, any required combination of bandwidths and communication services can be derived through the technique of Frequency Division Multiplexing to eliminate the "either/or" mode selector switches and hence the time-sharing restrictions. This arrangement is not currently possible under the existing tariff structure.

Some of the possible full-duplex channel combinations derivable from a single broad-band Telpak A are:

1. 11 telephones plus 18 teletypes

2. 15 kc/s FM Program Service (or data) plus 18 teletype or one telephone

3. 5 kc/s AM Program Service plus 18 teletype plus 2 telephone

4. Etc.

The combinations technically possible are endless and are determined only by the modulation capabilities of the modulator, the transmission channel bandwidth available and the channelizing hardware.

THE INSTITUTIONAL COMMUNICATIONS CENTER

The educational specifications define a need for an Institutional Communications Center (ICC) to be located at each CIC Institution including the campus on which the NCC is located. Clearly, the Institutional Communications Center may be combined with the Master Network Control Center on the "hub" campus.

A one-line functional diagram of the ICC is shown in Figure 7. This is similar to the NCC in many respects although much simpler since only one group of twelve Telephone NB Data trunks and only one full duplex Broad-band/Data channels with a single mode selector switch are involved. It is noted that the 12 Telephone/NB Data circuits interface through a simple manual patch panel with normal through plugs before being routed to the campus switchboard to provide convenient access for testing or other special purposes.

The principal function of the ICC office is to provide a termination for the Board-band/Data circuit and to be the "home base" for the broad-band terminal data equipment since it is not practical (at least initially) to extend the broad-band circuits to multiple campus locations.

THE CHAIRMAN'S CONFERENCE CONSOLE

An interesting feature of the Midwest system is a "Chairman's Conference Console." This is a dial/pushbutton console similar to a custom "Call Director" in which a department chairman at any one CIC institution, for example, may establish an "Electronic Conference" with his faculty counterparts at any one or all CIC Institutions.

The Conference Console will permit the "Conference Chairman" to dial any campus extension (through the operator at the Network Control Center) place the extension on "Hold" to permit dialing other campus extensions up to ten. The Conference Chairman, through the medium of illuminated "Hold" and "Tie" buttons, may exercise complete control of the conference. Each console (one at each CIC institution) will also be provided with plug-in connectors to accommodate the usual data equipment as shown to permit the exchange of hard copies of slow-scan television displays. The console would be connected to the intercampus lines through the manual patch panel on a pre-arranged schedule.

A sketch illustrating one possible layout for such a custom switching console is shown in Figure 8.

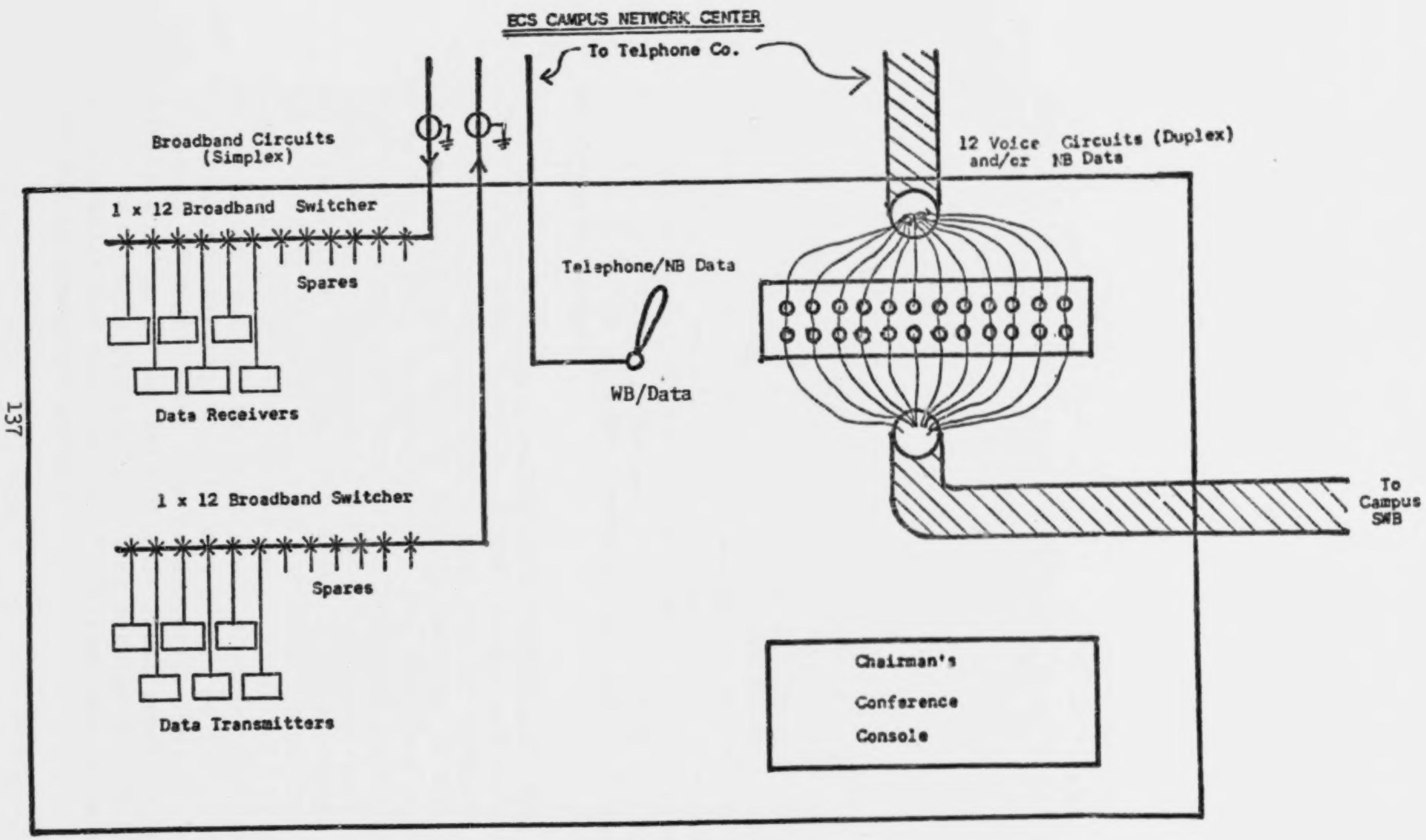

ECS CAMPUS NETWORK CENTER
To Telphone Co.
Broadband Circuits (Simplex)
12 Voice Circuits (Duplex) and/or NB Data
1 x 12 Broadband Switcher
Spares
Data Receivers
Telephone/NB Data
WB/Data
1 x 12 Broadband Switcher
Spares
Data Transmitters
To Campus SWB
Chairman's
Conference
Console

FIGURE 7: INSTITUTIONAL COMMUNICATIONS CENTER

TERMINAL EQUIPMENT COST SCHEDULE

In addition to the intercampus Telpak A network costs quoted earlier in the report, a leased communications service includes a variety of channel termination charges, local line charges, terminal equipment charges, etc. These additional charges are further subdivided into the categories of non-recurrent (or installation/connection) charges and recurrent monthly charges.

In the interest of simplicity, it is assumed that each CIC institution will (at least initially) be provided with identical terminal equipment facilities until a recognizable utilization pattern is established.

Since no attempt is made in this report to establish precisely the quantity of terminal equipment required at the individual institutions and the Network Control Center, a tabulation of the unit charges and minimum quantities for such items as channel terminations, terminal equipment, and interface equipment costs for the Institutional Communications Center (ICC) are tabulated in Figure 9. The unit costs shown in each category may be readily extended or reduced to any quantity. The absence of figures in non-recurrent charge columns indicate the unavailability of the particular terminal equipment from the common carrier. In these cases, the recurrent monthly charges constitute rental charges directly from the equipment manufacturer and includes maintenance charges.

Item 2 in Figure 9 refers to a "Universal" Data Phone. A "Universal" Data Phone is an ECS concept and is a standard dial telephone equipped with a data sub set connecter or jack so that a wide variety of data sets can be attached after the circuit is established. The interface equipment required by a specific data set to meet the common-carriers' transmission requirements would be an integral part of the data set rather than the "Data Phone." This concept eliminates the absurdity of leasing n standard Data Phones for use with n data sets (of which there are many) which only serves to increase the cost of the service and clutter up a desk with multiple special-purpose dial hand sets. No such device is currently offered by the common-carriers. However, all negotiations up to the date of this final report suggest that solutions to this problem are under serious and responsible consideration and that new tariff filings may be made by the time ECS is ready for service.

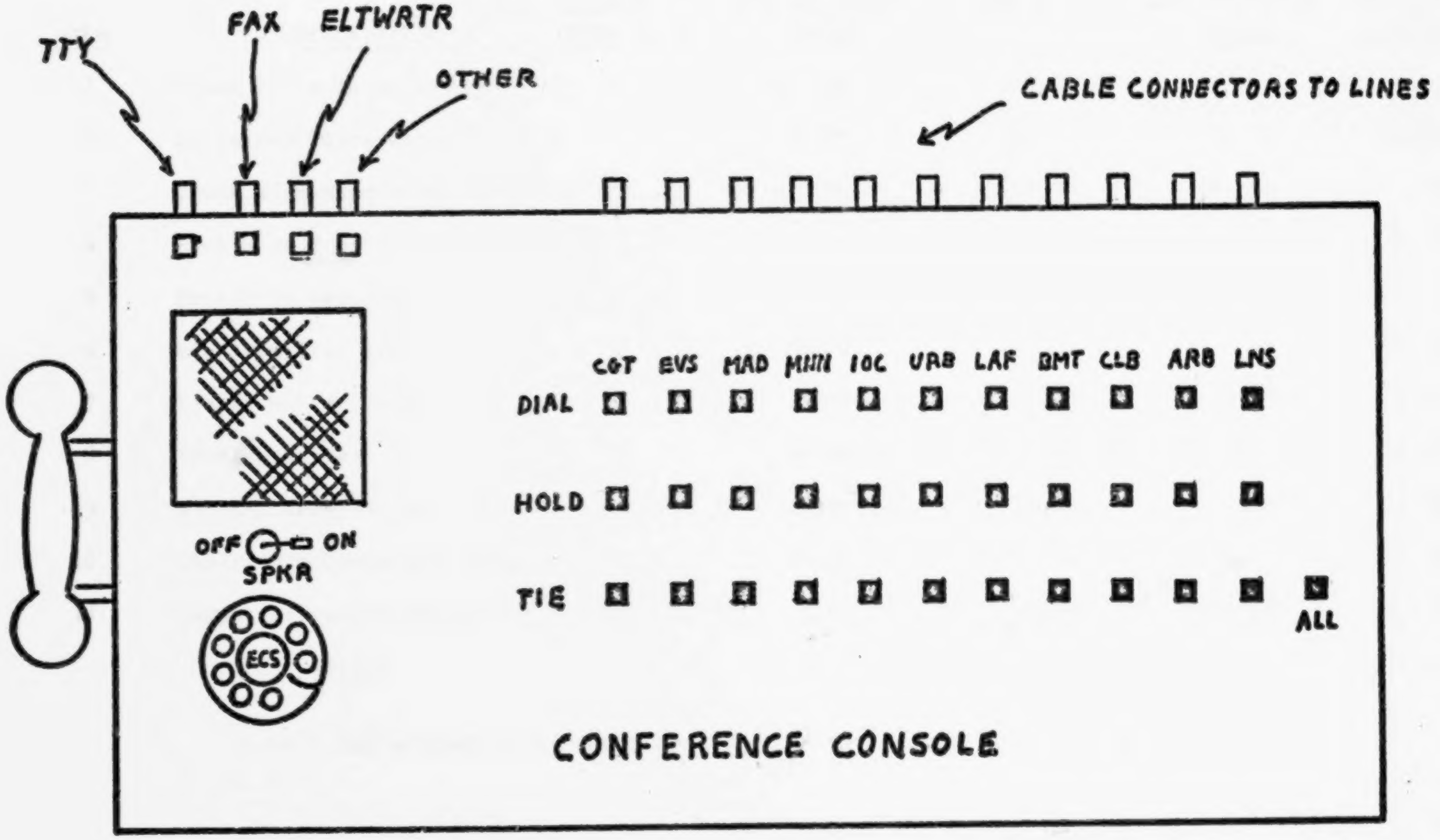

TTY
FAX
ELTWRTR
OTHER
CABLE CONNECTORS TO LINES
CGT
EVS
MAD
MHN
IOC
URB
LAF
BMT
CLB
ARB
LNS
DIAL
HOLD
TIE
ALL
OFF
ON
SPKR
ECS
CONFERENCE CONSOLE

FIGURE 8: CHAIRMAN'S CONFERENCE CONSOLE

ITEM	DESCRIPTION	MINIMUM QUANTITY	UNIT NON-RECURRENT CHARGE	UNIT MONTHLY CHARGE	TOTAL NON-RECURRENT CHARGE	TOTAL MONTHLY CHARGE
1	Trunk Voice Terminations	12	$10.00	$15.00	$120.00	$180.00
2	Universal "Data Phone"	1	25.00	40.00	25.00	40.00
3	Trunk Wide-Band Terminations	2	70.00	100.00	140.00	200.00
4	Facsimile Transmitter	1	---	115.00	----	115.00
5	Facsimile Receiver	1	---	105.00	----	105.00
6	Electrowriter Transceiver	1	38.00	40.00	38.00	40.00
7	Electrowriter Interface	1	15.00	8.00	15.00	8.00
8	Teletypewriter	1	25.00	50.00	25.00	50.00
9	TTY Ch. Termination	1	25.00	25.00	25.00	25.00
10	Chairman's Conference Console	1	25.00	25.00	25.00	25.00
11	Campus Lines (estimate)	10	5.00	10.00	50.00	100.00
	TOTALS				463.00	888.00

UNIT AND MINIMUM TOTAL COSTS FOR ICC TERMINATION/TERMINAL EQUIPMENT

FIGURE 9

ITEM	DESCRIPTION	MINIMUM QUANTITY	UNIT NON-RECURRENT CHARGES	UNIT MONTHLY CHARGE	TOTAL NON-RECURRENT CHARGE	TOTAL MONTHLY CHARGE
1	Manual Switchboard	1	$1,500	$1,200	$1,500	$1,200
2	Trunk Voice Terminations	132	10	15	1,320	1,980
3	12 x 12 Crossbar Broadband Switcher	1	100	150	100	150
4	1 x 12 Broadband Switcher	2	10	25	20	50
5	Trunk Wide-band Terminations	20	70	100	1,400	2,000
6	2 x 2 Narrowband Switcher	1	10	25	10	25
7	Data Phone	2	25	40	50	80
8	Teletypewriter	2	25	50	50	100
9	TTY Channel Termination	2	25	25	50	50
	TOTALS				4,500	5,635

UNIT AND MINIMUM TOTAL COSTS FOR MASTER NETWORK CONTROL CENTER LEASED TERMINAL EQUIPMENT

FIGURE 10

ITEM	SOURCE	NON-RECURRENT CHARGE (A)	RECURRENT MONTHLY CHARGE (B)
Total Network Interconnection Charge	Page 10	none/unknown*	$21,485.00
Minimum Institutional Communications Center Terminal Equipment Charge	Figure 9	$5,093.00**	9,768.00**
Minimum Master Network Control Center Terminal (LAF) Equipment Charge	Figure 10	4,500.00	5,635.00
TOTAL		9,593.00	36,888.00

*Based on costs of construction if new construction required
**The totals in Figure 9 multiplied by eleven.

Total cost for n months $= \sum A + n \sum B = 9{,}593 + n36{,}888$

SUMMARY OF MINIMUM TOTAL LEASED MEDIUM-BAND SYSTEM COSTS

FIGURE 11

ECS is faced with an important and significant alternative in this respect. This alternative involves the use of acoustical and inductive couplers with standard telephone subscriber sets to provide a legal (or rather a not illegal) coupling between the data set and telephone circuit. Such coupling devices are already available and in use on a limited basis for specific types of data sets or business machines.

Improved techniques and interface equipment can be developed. ECS has nothing to lose in the process of developing further such approaches to the problem of multiple Data Phones. The wide-spread use of existing and improved acoustical and inductive couplers will prove to be either a satisfactory legal solution to the existing tariff problem or encourage an objective review of the problem by the common-carriers and thus hopefully lead to the development and filing of new tariffs which will obviate the need for acoustical/inductive couplers.

The tabulation shown in Figure 9 represents something of an over-simplification of the common-carrier tariff structure. Furthermore, the tariff rates are not always uniform in all states. However, its use does provide a "ball park" figure of probable costs for decision-making purposes and can be readily refined for any specific situation.

Figure 10 is a tabulation of the terminal equipment cost schedule for the Network Control Center (NCC) located at the hub of the network as well as the interinstitutional network costs.

TOTAL MINIMUM COMMUNICATIONS SYSTEM COST SCHEDULE

The total minimum communications cost schedule involving a minimum of the terminal devices at each terminal location may be established by summing up the following:

1. Total inter-campus network charge.

2. Minimum termination/terminal equipment charge for each ICC (each institutional cost multiplied by eleven).

3. Minimum termination/terminal equipment/switching charge for the NCC.

4. Estimated local campus telephone line-extension charges.

The minimum non-recurrent and recurrent monthly charges with totals in each category are tabulated in Figure 11.

The totals for the non-recurrent charges (summation A) and recurrent monthly charges (summation B) provide the final form of the equation below:

Total cost for n months = 9,593 + n36,888

The initial (non-recurrent) and the monthly cost on a per institution basis is obtained by dividing each term of equation by eleven.

NETWORK B

THE MIDWEST MICROWAVE SYSTEM

Network B is a wide-band private microwave system capable of providing a high quality, multimedia, multichannel communications system free of the time-sharing restrictions of the leased Telpak system characteristic of Network A.

The Midwest wide-band microwave communications system has been designed to provide simultaneously the following channel facilities:

1. Twelve voice-grade telephone circuits between each CIC Institution and the network switching control centers. This is equivalent to a separate Telpak A facility identical to the common-carrier facilities described in the main body of the Preliminary Design Report.

2. One wide-band data channel suitable for use with high-speed digital and analog data terminal equipment.

3. Four narrow-band digital data transmission channels suitable for use with teletype terminal equipment and punched card/tape transceivers.

4. One 15 kc class AAA radio program channel interconnecting the 11 CIC institutions.

5. One 4.5 mc television channel with accompanying 15 kc program sound channel.

6. A service channel running the entire length of the microwave system to facilitate maintenance, and

7. A fault-alarm channel to facilitate maintenance of the microwave system.

The channel facilities provided by the microwave system are summarized on a "Channelizing Diagram" shown in Figure 12.

The complete Midwest microwave communications system is made up of the following major blocks and subelements:

I. The Microwave carrier

- a) Repeater buildings/land
- b) Towers/antennas
- c) Microwave transmitters, receivers, and repeaters.

II. The multiplexing equipment

- a) Telephone
- b) Wide-band data
- c) Narrow-band data
- d) Radio loop
- e) Television
- f) Television sound
- g) Service channel
- h) Fault alarm channel

III. Terminal Equipment

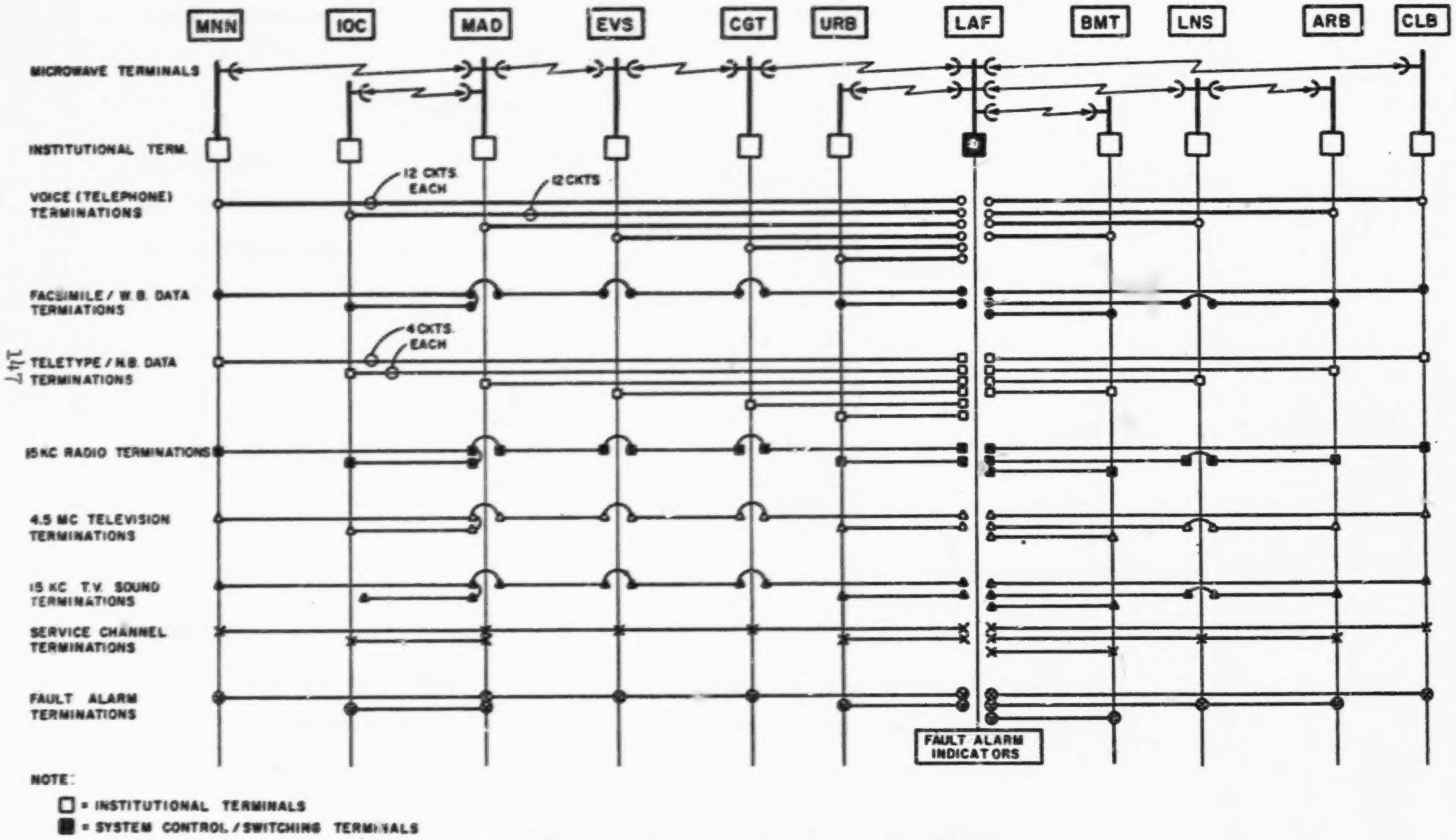
- a) Telephones
- b) Dial switchgear
- c) Facsimile transmitters/receivers
- d) Teletype transceivers
- e) Electrowriter transceivers, etc.

I. The Microwave Carrier

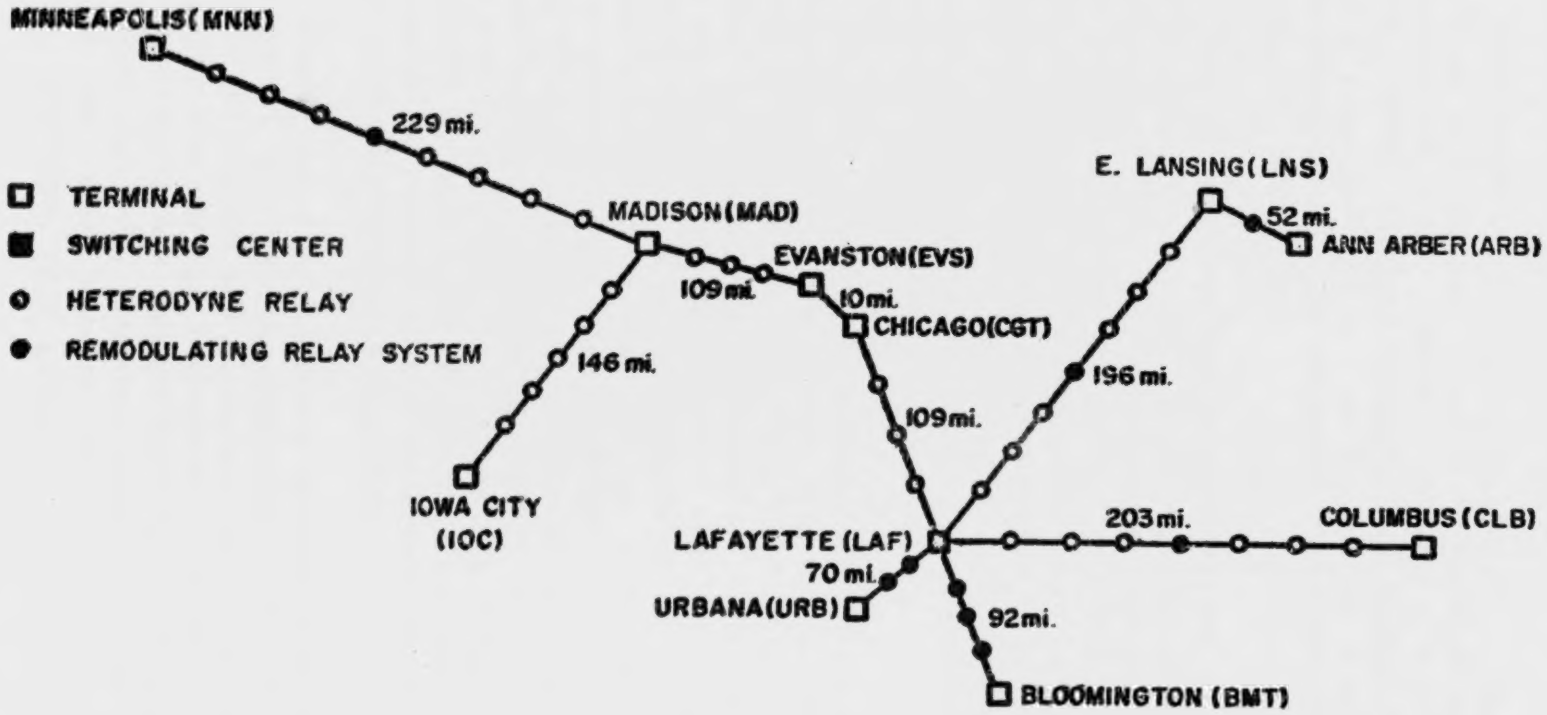
The microwave carrier system configuration is shown in Figure 13. The microwave carrier follows the same routing as the common-carrier Telpak paths shown in Figure 5 of this Report.

The channelizing diagram, Figure 12 of the report, reveals that the base band of the microwave carrier system must be wide enough to provide simultaneously a minimum of 60 voice-grade channels over one segment of the system (Lafayette-Chicago), wide-band and narrow-band data channels, and a 15 kc radio program channel in addition to a 4.5 mc television channel with accompanying program sound.

Although microwave carrier hardware currently available exhibits the necessary base bandwidth (approximately 8.0 mc) to accommodate all the channels on a frequency allocation basis, a detailed analysis of the performance characteristics of a single microwave channel with all of the diverse channels "stacked" on one baseband has revealed that the


MNN
IOC
MAD
EVS
CGT
URB
LAF
BMT
LNS
ARB
CLB
MICROWAVE TERMINALS
INSTITUTIONAL TERM.
VOICE (TELEPHONE) TERMINATIONS
12 CKTS. EACH
12 CKTS
FACSIMILE / W.B. DATA TERMIATIONS
TELETYPE / N.B. DATA TERMINATIONS
4 CKTS. EACH
15KC RADIO TERMINATIONS
4.5 MC TELEVISION TERMINATIONS
15 KC T.V. SOUND TERMINATIONS
SERVICE CHANNEL TERMINATIONS
FAULT ALARM TERMINATIONS
FAULT ALARM INDICATORS
NOTE:
☐ = INSTITUTIONAL TERMINALS
■ = SYSTEM CONTROL / SWITCHING TERMINALS

MIDWEST SYSTEM CHANNELIZING DIAGRAM
FIGURE 12


MINNEAPOLIS(MNN)
229 mi.
TERMINAL
SWITCHING CENTER
HETERODYNE RELAY
REMODULATING RELAY SYSTEM
MADISON(MAD)
EVANSTON(EVS)
109 mi.
10 mi.
CHICAGO(CGT)
146 mi.
IOWA CITY
(IOC)
109 mi.
E. LANSING(LNS)
52 mi.
ANN ARBER(ARB)
196 mi.
LAFAYETTE (LAF)
70 mi.
URBANA(URB)
92 mi.
BLOOMINGTON (BMT)
203 mi.
COLUMBUS (CLB)

SUMMARY:

Six end terminals	One five-way terminal
Three thru terminals	Nine remodulating repeaters
One three-way terminal	Thirty heterodyne repeaters

MIDWEST MICROWAVE SYSTEM
FIGURE 13

overall performance on a system of the size proposed would be unsatisfactory at the present state of the art.

The baseband of a micorwave carrier can be divided into 600 or more telephone circuits to provide satisfactory telephone service. However, this is possible only because of the random statistical nature of speech signals and the random usage pattern of the 600 channels by 600 pairs of individual users. For example, consider the following "nonrandom" experiment.

If a group of telephone subscribers using a microwave carrier capable of handling 600 unrelated conversations were to recite, on cue, the same phrase simultaneously, it would take less than 10% of the users to overtax the carrier system modulation capability so severely that intolerable distortion would be produced. As a consequence, the message would be unintelligible. The telephone companies depend similarly on the random dialing habits of their subscribers to provide adequate switching facilities.

Television signals, because of their periodic or nonrandom nature and because the same signal is distributed over a very wide bandwidth, do not exhibit the random properties of many individual speech signals. Wide-band data signals-both analog and digital-exhibit similar "high-loading" characteristics. The consequence of all this to the system hardware designer is that 4.5 mc of TV frequency spectrum space transmitting a highly redundant signal is equivalent in terms of modulation requirements to much more than 4.5 mc of ordinary multiple-channel speech spectrum space. This fact seriously restricts the maximum modulation percentage allocated to each type of channel "stacked" on a single microwave carrier if severe intermodulation distortion is to be held to acceptable minimums.

Therefore, the microwave carrier system described in this report utilizes two separate microwave carriers - one for the television and accompanying sound channel and the other for the message (telephone) channels, 15 kc radio program channel and medium-band data channels. The two microwave carriers, however, share the simultaneous use of much of the common physical facilities such as buildings, towers, antennas, wave guide runs, etc.

At this stage of the microwave carrier design, detailed path surveys and a study of the availability of frequency channel assignments have not been made.

Accordingly, the following assumptions have been made.

1. The average length of the microwave paths will be 25 miles.

2. The average tower height will be 225 feet above ground level.

3. The average antenna size will be 10 feet in diameter.

4. The average cost of land acquisition and access road construction to each repeater site will be $3000.00.

The antennas are to be tower mounted with wave-guide type feed lines to eliminate the cheaper antenna/reflector combinations which result in excessive side-lobe radiation which generally complicate the frequency allocations problem in congested areas. The tower mounted antennas have also been equipped with plastic radomes to prevent the formation of ice on the antenna feed horn and to present a more symmetrical spherical shape to minimize wind-loading effects on the supporting tower.

The more expensive heterodyne type or non-remodulating microwave repeaters have been used as much as practical to provide the best possible overall system performance the present state-of-the-art permits.

Long experience with extensive microwave systems operated by the common-carriers, pipe-line and electric power utility companies have demonstrated that interruption of primary power service is the most common single factor responsible for system failure. Accordingly, the carrier system described in this report is fully transistorized and battery powered with a battery charger continuously operating to maintain the charge level. During a primary power outage, the batteries will continue to operate the equipment satisfactorily for eight hours. This period is usually more than adequate to restore primary power.

The total cost of the microwave carrier system reduced to total capital outlay and annual operating/maintenance cost is developed and summarized in Figures 14 through 19.

II. The Channel Multiplexing Equipment

The multiplexing equipment which electronically subdivides the wide microwave baseband into a large number of individual narrow bandwidth channels is listed and priced in Figures 20 and 21. Figure 20 lists the multiplexing equipment required at each end terminal, through terminal, and 3-way terminal to provide the diverse channels shown in the channelizing diagram of Figure 12. Figure 21 lists the multiplexing equipment for a 5-way terminal required at the Network Switching Control Center (NCC) at Lafayette, Indiana.

The 4.5 mc television video and accompanying 15 kc program sound multiplexing equipment is connected to the microwave channel designated as the TV channel and all the remaining multiplex equipment is connected to the second micorwave channel designated as the message/data channel. Of course, the TV channel may be pressed into service (on a time shared basis) as a high speed data channel.

III. The Terminal Equipment

The terminal equipment necessary to complete the message/data/television system may be classified into the following categories:

a) The telephone system/dial switching facilities

b) The digital/analog data equipment

a) The Telephone System

The telephone system proposed for use with the microwave communications system is a dial-to-dial access system with complete ring-down and ring-back signaling facilities. A small local dial exchange is provided at each CIC institution so that up to 100 campus telephones may gain dial access to any one of the idle interinstitution trunks. A main tandem dial exchange switcher located at the system control/switching center provides access, in turn, to an available trunk to the appropriate institution and finally to the telephone number dialed.

ITEM	DESCRIPTION	QUANTITY	UNIT COST	TOTAL COST (A)	% MAINT.	ANNUAL MAINT. (B)
1	225 foot guyed tower	1	7,161	7,161	2.0	143
2	A-2 lighting kit	1	920	920	2.0	18
3	10' parabolic dish and feedhorn	1	915	915	2.0	18
4	Radome for 10' dish	1	400	400	2.0	8
5	Tower mount for 10' dish	1	140	140	2.0	3
6	Waveguide run	1	1,228	1,228	2.0	24
7	Pressurized automatic dehydrator	1	600	600	2.0	12
8	Microwave transmitter/receiver	2	6,846	13,692	4.5	615
9	Service channel	1	863	863	4.5	39
10	10 alarm remote fault alarm	1	990	990	4.5	45
11	Battery plant and charger - 50 amp hours	1	1,320	1,320	4.5	594
12	Building--8' x 16' x 8' prefabricated (including heating, air conditioning A.C. wiring, distribution panel, conduit, outlets, foundation, and freight up to 1000 miles)	1	3,126	3,126	1.8	56
	TOTALS FOR END TERMINAL			31,355		1,575

MICROWAVE END-TERMINAL EQUIPMENT

FIGURE 14

ITEM	DESCRIPTION	QUANTITY	UNIT COST	TOTAL COST (A)	% MAINT.	ANNUAL MAINT. (B)
1	225 foot guyed tower	1	7,161	7,161	2.0	143
2	A-2 lighting kit	1	920	920	2.0	18
3	10' parabolic dish and feedhorn	2	915	1,830	2.0	37
4	Radome for 10' dish	2	400	800	2.0	16
5	Tower mount for 10' dish	2	140	280	2.0	6
6	Waveguide run	2	1,228	2,456	2.0	49
7	Pressurized automatic dehydrator	1	600	600	2.0	12
8	Microwave transmitter/receiver	4	6,846	25,384	4.5	1,140
9	Service channel	1	863	863	4.5	39
10	10 alarm remote fault alarm	1	990	990	4.5	45
11	Battery plant and charter - 50 amp hours	1	1,320	1,320	4.5	594
12	Building--8' x 16' x 8' prefabricated (including heating, air conditioning, A.C. wiring, distribution panel, conduit, outlets, foundation and freight up to 1000 miles)	1	3,126	3,126	1.8	56
	TOTALS FOR REMODULATING RELAY			45,730		2,155

MICROWAVE REMODULATION REPEATER AND THRU TERMINAL EQUIPMENT

FIGURE 15

ITEM	DESCRIPTION	QUANTITY	UNIT COST	TOTAL COST (A)	% MAINT.	ANNUAL MAINT. (B)
1	225 foot guyed tower	1	7,161	7,161	2.0	143
2	A-2 lighting kit	1	920	920	2.0	18
3	10' parabolic dish and feedhorn	2	915	1,830	2.0	37
4	Radome for 10' dish	2	400	800	2.0	16
5	Tower mount for 10' dish	2	140	280	2.0	6
6	Waveguide run	2	1,128	2,456	2.0	49
7	Pressurized automatic dehydrator	1	600	600	2.0	12
8	Heterodyne microwave repeater	2	21,925	43,850	4.5	1,973
9	Service channel	1	1,433	1,433	4.5	65
10	10 alarm remote fault alarm	1	990	990	4.5	45
11	Battery plant and charger - 50 amp hours	1	1,320	1,320	4.5	594
12	Building--8' x 16' x 8' prefabricated (including heating, air conditioning, A.C. wiring, distribution panel, conduit, outlets, foundation and freight up to 1000 miles)	1	3,126	3,126	1.8	56
	TOTALS FOR HETERODYNE REPEATER			64,766		3,014

MICROWAVE HETERODYNE REPEATER EQUIPMENT

FIGURE 16

ITEM	DESCRIPTION	QUANTITY	UNIT COST	TOTAL COST (A)	% MAINT.	ANNUAL MAINT. (B)
1	225 foot guyed tower	1	7,161	7,161	2.0	143
2	A-2 lighting kit	1	920	920	2.0	18
3	10' parabolic dish and feedhorn	3	915	2,745	2.0	55
4	Radome for 10' dish	3	400	1,200	2.0	24
5	Tower mount for 10' dish	3	140	420	2.0	8
6	Waveguide run	3	1,228	3,684	2.0	74
7	Pressurized automatic dehydrator	1	600	600	2.0	12
8	Microwave transmitter/receiver	6	6,846	41,076	4.5	1,850
9	Service channel	1	863	863	4.5	39
10	10 alarm remote fault alarm	1	990	990	4.5	45
11	Battery plant and charger - 100 amp hours	1	1,823	1,823	4.5	82
12	Building--8' x 16' x 8' prefabricated (including heating, air conditioning, A.C. wiring, distribution panel, conduit, outlets, foundation, and freight up to 1000 miles)	1	3,126	3,126	1.8	56
	TOTAL FOR 3-WAY TERMINAL			64,608		2,406

MICROWAVE 3-WAY TERMINAL EQUIPMENT

FIGURE 17

ITEM	DESCRIPTION	QUANTITY	UNIT COST	TOTAL COST (A)	% MAINT.	ANNUAL MAINT. (B)
1	225 foot guyed tower	1	10,161	10,161	2.0	143
2	A-2 lighting kit	1	920	920	2.0	18
3	10' parabolic dish and feedhorn	5	915	4,575	2.0	91
4	Radome for 10' dish	5	400	2,000	2.0	40
5	Tower mount for 10' dish	5	140	700	2.0	14
6	Waveguide run	5	228	1,140	2.0	23
7	Pressurized automatic dehydrator	1	600	600	2.0	12
8	Microwave transmitter/receiver	10	6,846	68,460	4.5	3,080
9	Service channel	1	863	863	4.5	39
10	Master alarm receiver - up to 10 remotes	4	8,443	33,722	4.5	1,520
11	Battery plant and charger - 180 amp hours	1	2,530	2,530	4.5	114
12	Building--8' x 16' x 8' prefabricated (including heating, air conditioning, A.C. wiring, distribution panel, conduit, outlets, foundation, and freight)	1	3,126	3,126	1.8	56
	TOTAL FOR 5-WAY TERMINAL			128,847		5,150

MICROWAVE 5-WAY TERMINAL EQUIPMENT

FIGURE 18

MAP ABBREVIATION	UNIVERSITY	TERMINAL TYPE	CAPITAL OUTLAY (A)	ANNUAL MAINT. (B)
MNN	University of Minnesota	End	31,355	1,575
IOC	University of Iowa	End	31,355	1,575
URB	University of Illinois	End	31,355	1,575
ARB	University of Michigan	End	31,355	1,575
CLB	Ohio State University	End	31,355	1,575
BMT	Indiana University	End	31,355	1,575
LNS	Michigan State University	Thru	45,730	2,155
EVS	Northwestern University	Thru	45,730	2,155
CGT	University of Chicago	Thru	45,730	2,155
MAD	University of Wisconsin	3-way	64,608	2,406
LAF	Purdue University	5-way	128,847	5,150
	30 Heterodyne repeaters		1,942,980	90,420
	9 Remodulation repeaters		411,570	19,395
	Repeater operating power cost			23,400
	Land purchases and Access Road Costs for 39 Relay Stations		117,000	234
	TOTAL MICROWAVE EQUIPMENT COST		2,925,717	156,920

MIDWEST MICROWAVE EQUIPMENT SUMMARY

FIGURE 19

END TERMINAL/THRU TERMINAL/3-WAY TERMINAL
MULTIPLEXING EQUIPMENT

ITEM	DESCRIPTION	QUANTITY	UNIT COST	TOTAL COST
	12 VOICE-GRADE CHANNELS:			
1	Combination rack/power supplies	1	$ 1,575	$ 1,575
2	Group modem shelf	1	100	100
3	Group modem	1	475	475
4	Group flanking network	4	65	260
5	Basic supergroup unit	1	370	370
6	Group carrier shelf & comm. eqpt.	1	1,320	1,320
7	Group carrier selector	1	375	375
8	Master oscillator shelf	1	1,600	1,600
9	Channel carrier supply shelf	1	100	100
10	Channel carrier selector	12	300	3,600
11	Supergroup receiving shelf	1	100	100
12	Supergroup sending shelf	1	120	120
13	Channel shelf and alarm	1	200	200
14	Channel modem and cable	12	440	5,280
15	Terminal shelf & alarm	1	185	185
16	4-wire E & M Term. units	12	280	3,360
17	Baseband amplifier	1	400	400
18	Baseband atten/impedance match	1	60	60
	TELEVISION PROGRAM SOUND (15kc)			
19	Program Sound Sub-carr. Trans.	1	375	375
20	Program Sound Sub-carr. Recv.	1	575	575
	RADIO PROGRAM SOUND (15kc)			
21	Sound Sub-carr. Trans.	1	374	375
22	Sound Sub-carr. Recv.	1	575	575
	WIDE BAND DATA CHANNEL			
23	Data Sub-carr. Trans.	1	2,000	2,000
24	Data Sub-carr. Recv.	1	3,000	3,000
	TELETYPE DATA CHANNEL			
25	Teletype Sub-carr. Trans.	4	675	2,700
26	Teletype Sub-carr. Recv.	4	675	2,700
	TOTAL COST (A)			31,780
	Total Annual Maintanence at 4.5% (B)			1,430

FIGURE 20

5-WAY TERMINAL MULTIPLEXING EQUIPMENT

ITEM	DESCRIPTION	QUANTITY	UNIT COST	TOTAL COST
	120 VOICE-GRADE CHANNELS			
1	Common Eqpt. rack/power supplies	1	$ 1,305	$ 1,305
2	Channel racks/power supplies	2	1,575	3,150
3	Group modem shelf	1	100	100
4	Group modem	10	475	4,750
5	Basic supergroup unit	2	370	740
6	Group carr/common eqpt.	1	1,320	1,320
7	Group carr. selector	5	375	1,875
8	Master oscillator shelf	1	1,600	1,600
9	Channel carr.supply shelf	1	100	100
10	Channel carr. selector	12	300	3,600
11	Supergroup carr. shelf	1	90	90
12	Supergroup carr. selector	1	485	485
13	Supergroup recv. shelf	1	100	100
14	Supergroup recv. hybrid	1	280	280
15	Supergroup recv. unit	2	560	1,120
16	Supergroup send shelf	1	120	120
17	Supergroup send hybrid	1	215	215
18	Supergroup send unit	2	220	440
19	Channel shelf and alarm	10	200	2,000
20	Channel modem & cable	120	440	52,800
21	Baseband amplifier	5	400	2,000
22	Baseband attenuator	5	60	300
23	Signal shelf	10	185	1,850
24	Signal units	120	280	33,600
	TELEVISION PROGRAM SOUND (15kc)			
25	Program sound subcarr. Transm.	5	375	1,875
26	Program sound subcarr. Recv.	5	575	2,875
	RADIO PROGRAM SOUND (5kc)			
27	Sound subcarr. Transm.	5	375	1,875
28	Sound subcarr. Recv.	5	575	2,875
	WIDE BAND DATA CHANNEL			
29	Data subcarr. Transm.	5	2,000	10,000
30	Data subcarr. Recv.	5	3,000	15,000
	TELETYPE DATA CHANNEL			
31	Teletype subcarr. Transm.	40	675	27,000
32	Teletype subcarr. Recv.	40	675	27,000
	TOTAL COST (A)			202,440
	Total annual maintenance at 4.5% (B)			9,120

FIGURE 21

ITEM	DESCRIPTION	QUANTITY	UNIT COST	TOTAL COST (A)	% MAINT.	ANNUAL MAINT. (B)
1	Dial Telephones	50	$ 26	$ 1,300	5	65
2	Electrowriter Transceivers	4	1,215	4,860	10	481
3	Facsimile Receivers	4	2,700	10,800	10	1,080
4	Facsimile Transmitters	4	3,000	12,000	10	1,200
5	Teleprinter Transceivers	4	1,970	7,880	4	316
6	Chairman's Conference Console	1	5,000	5,000	5	250
7	Local Dial Exchange	1	8,500	8,500	5	425
	TOTAL			50,340		3,817

CIC INSTITUTIONAL TERMINAL EQUIPMENT

FIGURE 22

ITEM	DESCRIPTION	QUANTITY	UNIT COST	TOTAL COST (A)	% MAINT.	ANNUAL MAINT. (B)
1	Dial Telephones	2	26	52	5	3
2	Teleprinter Transceivers	2	1,970	3,940	10	390
3	Chairman's Conference Console	1	5,000	5,000	10	500
4	Main Dial Exchange	1	27,000	27,000	5	1,350
5	6 x 6 Video/Audio Switcher	1	2,475	2,475	5	125
6	6 x 6 Radio Switcher	1	2,475	2,475	5	125
7	6 x 6 FAX/WB Data Swticher	1	2,475	2,475	5	125
8	12 x 12 Teletype/NB Data	1	2,000	2,000	5	100
	TOTALS			45,417		2,718

ECS NETWORK SWITCHING/CONTROL CENTER TERMINAL EQUIPMENT

FIGURE 23

ITEM	DESCRIPTION	QUANTITY	REFER TO FIGURE	TOTAL COST (A)	ANNUAL MAINT. (B)
1	5-way terminal multiplexing equipment	1	A10	202,440	9,120
2	Institutional multiplexing equipment	10	A 9	317,800	14,300
3	Institutional terminal equipment	11	A11	553,740	41,987
4	Network switching/control terminal equipment	1	A12	45,417	2,718
5	T.V. scan converter transmitter	1		10,000	250
6	T.V. scan converter receiver	1		10,000	250
	TOTALS			1,139,397	68,625

SUMMARY OF MIDWEST MULTIPLEXING
AND TERMINAL EQUIPMENT

FIGURE 24

The telephone switching system proposed for the private microwave system is a fully automatic dial-to-dial access system since supervisory control at the network control center is not required.

It is recognized, of course, that the use of a non-common-carrier micorwave system necessitates the use of non-leased termination/terminal equipment. The telephone subscriber sets are no exception. This, in turn, necessitates the construction of local subscriber lines from the switching facilities to the telephone instruments. Obviously this also means duplicate telephone instruments on the desks at key locations on each campus where ECS facilities are desired such as research centers, libraries, offices of deans and other administrative/faculty officers. Under certain circumstances, which must be explored in detail, the interconnection of private facilities with the common-carriers at switching interfaces may be possible.

b) The Digital/Analog Data Equipment

The data terminal equipment consists of:

a) Electrowriter type transceiver
b) Facsimile receivers and transmitters
c) Teletype transceivers
d) Chairman's Conference Console
e) Television scan converters

Figure 22 is a tabulation of a minimum list of terminal equipment meeting the initial requirements of each of the CIC institutions. Figure 23 is a tabulation of the minimum terminal equipment for the System control/Switching Center. Figure 24 summarizes the total system multiplex and terminal equipment costs. It will be observed that only one scan converter receiver/transmitter pair has been provided for the Midwest model. This has been done because of the availability of a wide-band TV transmission channel on a full-time basis, and the high cost of slow-speed scan converters which are still regarded as experimental devices from both a hardware and utilization standpoint.

IV. Supervisory/Maintenance Channels

a) Service Channel: A full duplex party line service channel is furnished to provide necessary communications for coordination between maintenance personnel without interfering with the regular channel facilities.

b) Fault Alarm: The fault alarm system provides automatic indication of repeater location and nature of equipment fault to expedite maintenance of the system. Five faults occurring at each remote repeater location can be reported automatically as follows:

1. Microwave equipment failure
2. Primary power failure
3. Tower beacon/side light failure
4. Unauthorized building entry
5. Spare

FINAL SYSTEM COST SUMMARY AND CONCLUSION

The total cost estimates for the microwave carrier, the multiplex switching, and terminal equipment are summarized in Figure 25 to yield a grand total for the complete Midwest Microwave Communications System.

The Final System Summary Sheet includes an estimate to cover detailed engineering costs and installation of the system as well as an estimate of the annual operating power costs for the microwave repeaters.

The final cost is expressed in terms of the formula:

$$\text{Total Cost} = \Sigma A + n\Sigma B$$

Where A is the capital outlay costs
and B is the annual operating costs
and n is the number of years.

Combining all the A and B costs yields the following total cost formula:

$$\text{Total Cost} = 4,674,881 + n506,037$$

The performance standards of the microwave communications system described is equal to or better than standard toll quality. This is due primarily to the selection of the best available microwave and multiplexing equipment manufactured primarily for the common-carrier market, and the performance margins designed into the system. It should be noted also that the frequency allocations and modulation plan used in multiplex equipment conforms to CCITT standards* developed originally by the Bell System. Thus the use of the basic 12 voice-channel group (Telpac A) as a basic building block permits an orderly expansion to hundreds of channels as well as interfacing with any of the common-carriers should such an opportunity eventually arise.

COST COMPARISON OF PRIVATE MICROWAVE COMMUNICATIONS FACILITY WITH EQUIPMENT LEASED SERVICES.

The cost of leased services are based on the equivalent facilities provided by the Midwest private microwave system. They are:

1. Twelve (12) voice circuits identical to the circuits available with Network A.

2. One (1) party-line type 20 mc facsimile/WB data channel equivalent to Telpak A with type A1 termination.

3. Four (4) teletype/NB Data circuits from the Network Control Center (NCC) to each Institutional Communications Center (ICC).

4. One (1) full duplex 15 kc/15 kc AM/FM radio loop.

5. One (1) full duplex 4.5 mc TV channel with accompanying program sound channel.

The initial and annual leasing costs for full-period service equivalent to the facilities provided by the wideband private microwave system are summarized in Figure 26. Thus the cost formula for the leased services is:

Leased service cost = 7,200 + n1,262,966

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*The CCITT is the International Telephone and Telegraph Consultative Committee which is a body of the International Telecommunications Union (ITU, an agency of the United Nations) headquartered in Geneva, Switzerland.

DESCRIPTION	REFER TO FIGURE	TOTAL COST (A)	ANNUAL MAINT. (B)
Microwave Equipment	19	2,725,717	156,920
Multiplex and terminal Equipment	24	1,139,397	68,625
Subtotal		4,065,114	225,545
Final engineering supervision, path calculations, installation, etc., 15% of subtotal		712,311	
Annual interest@6% of capital outlay			280,492
Total		4,674,881	506,037

System cost $= \sum A + n\sum B$

$= 4{,}674{,}881 + n506{,}037$

COMPLETE MIDWEST MICROWAVE COMMUNICATIONS
SYSTEM COST

FIGURE 25

DESCRIPTION	NON-RECURRENT COSTS	ANNUAL LEASE COSTS
Telpac B 228 mi @$20/mi/month		$28,560
Telpac C 1,216 mi @$25/mi/month		304,800
Duplex TV/audio 1216 mi @ $40/mi/month		583,680
Class AAA FM Program 1,216 mi @ $11.70/mi/month		170,726
240 Telephone voice terminations	$2,400	43,200
40 Wideband terminations	2,800	48,000
80 Teletype terminations	2,000	24,000
TOTAL	7,200	1,262,966

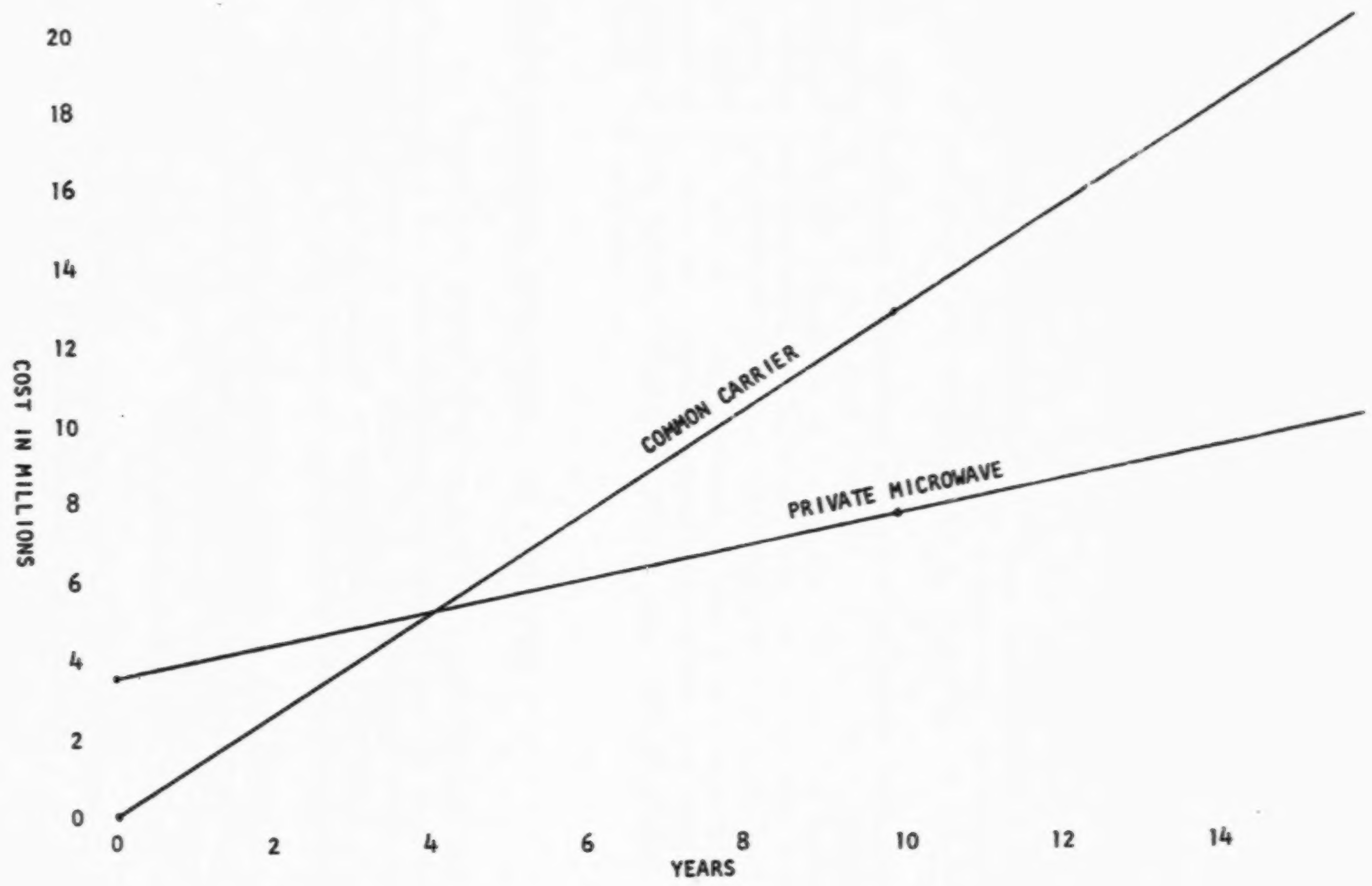
Total Cost Network B (less terminal equipment)

leased Service = 7,200 + n1,262,966

Private own/maint = 3,445,957 + n180,340

COMPARISON OF
COMMON CARRIER VS PRIVATE MICROWAVE COSTS
FOR NETWORK B

FIGURE 26



GRAPHICAL COMPARISON OF COMMON CARRIER VS. PRIVATE TRANSMISSION COST

FIGURE 27

The cost formula for the transmission facilities provided by the private microwave system is:

Prvt. Microwave cost = $x + ny$ = 3,445 + n810,340

Where Y includes the cost of operating and maintenance as well as 6% annual interest on the capital outlay.

Figure 27 is a plot of these two cost formulae shown together for convenient comparison. It is dramatically evident that construction of a private microwave system is not justifiable unless the communications service/facilities are required over a period of at least 4 years, the equal-cost, or "pay-out" time for the private microwave system. The significant transmission cost reduction possible with the private system over the leased costs, over an extended period of ten years for example, is also demonstrated.

The foregoing comparison is based on the interinstitutional transmission costs only and does not include the terminal hardware such as telephone instruments, teletypewriters, facsimile transceivers, electrowriters, etc., as was done in Network A and Network B. The cost figures for such terminal equipment as tabulated for Network A and B (which are not equivalent!) can be compared separately after the required quantities are established and can be expected to yield similar conclusions.

PRIVATE MICROWAVE REGULATORY CONSIDERATIONS

One important point with regard to construction and operation of a private microwave system by ECS or any other educational group is that while such an approach overcomes many common-carrier tariff restrictions, the private microwave apporach is not free of undesirable regulatory restrictions.

The construction of private microwave systems for either educational or commercial/industrial applications is regulated by the Federal Communications Commission under two separate parts of the FCC Rules and Regulations. They are:

1. The Television Auxiliary Broadcast Services Part 74, Subpart F of FCC Rules and Regulations

2. The Industrial Radio* Services, Part 91, Subpart L, of FCC Rules and Regulations

Licensees operating under the Television Auxiliary Broadcast Service (Part 74) are restricted to the transmission of broadcast program materials only (TV broadcast station interconnections) with closed circuit communications channel facilities permitted only as an incidental function!

On the other hand, licensees operating a closed-circuit network under the Industrial Radio Services (Part 91) are restricted to a maximum RF bandwidth of 10 mc. It is generally recognized among responsible and competent engineers that a maximum RF spectrum space of 10 mc per microwave channel using the frequency modulation (FM) method of modulating the microwave carrier will not provide adequate overall performance for long haul systems. The transmission impairments in terms of video baseband width, signal-to-noise ratio, etc., due to the restricted FM deviation permissible are particularly severe when even a small number of communication channels are "stacked" on the video signal and in fact unsatisfactory for the transmission of television programs alone.

A number of courses of action are available to the planners of multi-media educational microwave networks:

1. Plan an educational TV broadcast station interconnection network licensed under Part 74 and intended primarily to handle broadcast program material with communications/data channels as an incidental function.

2. Plan a closed-circuit micorwave system licensed under Part 91 with a request for waiver of the existing FCC rules to permit assignment of two contiguous 10 mc channels for use as a single 20 mc assignment. The Texas Educational Microwave Project (TEMP) is an operational example of this approach. However, it should be recognized that this is an exception to the existing Rules and Regulations and there is

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*The term Radio is here used in its broad general sense meaning the transmission of information over electromagnetic radiations without the use of wires, which includes fixed point-to-point microwave transmission.

no absolute assurance that additional exceptions or waivers will be granted.

3. Since it is generally recognized that the performance of long-haul microwave systems operating under the Industrial Radio Services section is not satisfactory, the educational interests with the support of the industrial interests formally request the Federal Communications Commission to establish new rules permitting 20 mc (preferably 25 mc) microwave channel widths for long-haul applications. If this approach fails, conceivably the FCC could be persuaded to make such rulings on a case-by-case basis.

4. Establish a non-profit educational common-carrier corporate entity that would be eligible to operate a multipurpose microwave system as a miscellaneous or limited common-carrier.

EDUCATIONAL COMMUNICATIONS SYSTEM
INTRASTATE (OREGON) MODEL

Kenneth L. Warren

INTRASTATE (OREGON) MODEL

METHOD

As in the other ECS models, development procedures in Oregon were devised to achieve broad, representative involvement and participation in the work of design.

Methods used to arrive at educational specifications for the intrastate (Oregon) model of the Educational Communications System were developed and carried out by institutional representatives to the Oregon ECS project, who were appointed by institutional executives of the Oregon State Systems of Higher Education member colleges and universities.

Activity for the purpose of collecting information to determine educational specifications for the intrastate model began in October of 1965. Institutional representatives were convened for briefing, orientation, and development of procedures to be used in designing the intrastate model. The concensus of that meeting was that the first and most important step in determining specific educational communications needs in Oregon would be conversations and interviews with faculty members, academic and administrative, of all the institutions of the Oregon State System of Higher Education.

Concurrent with the on-campus discussions, the associate project director was conducting a series of interview/information conversations with representatives of state government, members of the Chancellor's staff, and various interinstitutional groups not directly reached by institutional representatives. After a series of on-campus interviews by the institutional representatives, the associate project director personally visited several campuses for follow-up discussions with interested faculty members, to explain the ECS concept further and to detail development of the formative stages of the intrastate model.

The purpose of these weeks of conferences, interviews, telephone calls, and presentations was to obtain as complete and as composite a picture as possible of educational communications needs, desires and problems, primarily through their articulation within the State System of Higher Education, but with consideration and concern also for the role and involvement of state government.

Following this relatively informal process, a survey questionnaire was devised and widely distributed. Results closely corroborated those of the earlier discussions.

RESULTS and DISCUSSION

Discovered Needs

The investigations outlined above led to the conclusion that there does exist in the Oregon State System of Higher Education a need for more effective means of educational communication, both for administration and for instructional uses. The smaller components of the Oregon State System particularly expressed a need to be in closer touch with larger institutions, not only for administrative functions, but also to avail themselves of greater instructional potential through access to larger centers of academic activity.

The need for more convenience and speed in exchange of information between institutions of the Oregon State System of Higher Education was also articulated, especially in cases where any form of documentation is required, whether for purposes of administration, instruction, library operation, or research.

Other needs discovered in the Oregon study relate to the following areas:

1. Continuing Education: Many persons now recognizing the need to continue their educations, professional and otherwise, are spread throughout the state of Oregon in relatively small groups. There is a need to reach these persons more effectively and conveniently with instructional materials and assistance from a central facility where teaching talent and facilities are readily available.

2. Library Operations: There is a need for more rapid transmission of library materials between institutions. This would be particularly helpful to smaller components of the Oregon State System of Higher Education, although larger institutions have also indicated difficulties in expediting

delivery of materials from one campus to another. Another basic need in library operations is for reduction of labor and effort in control, organization, and access to stored information. Although this need may be felt most prominently within each individual library's operation, it exists at the interinstitutional level as well, primarily because of the lack of a more comprehensive system of information transmission.

3. Administration: With the growing trend toward automated procedures for registration, maintaining student and faculty records, business transactions and other functions dealing with the administration of institutions of higher education, there is a need for speed and flexibility of communications. In the Oregon State System of Higher Education, for example, while there is already heavy reliance on computing equipment to conduct business affairs, many payroll and accounting functions are carried out at the departmental and campus business office level largely by hand-processing techniques. There is a demonstrable need for speedup in daily communications and circulation of documented information.

4. Location and Retrievel of Research Data: As research activities place more emphasis on electronic data processing equipment, the need grows to locate and retrieve such data more effectively. This process is conducted not only between the individual researcher and the computer, but between computers themselves.

5. Exchange of Instructional Information: As institutions of higher education become more aware of their interdependence, and of the desirability of exchanging instructional materials, the need for a transmission system becomes more apparent. The needs of the college instructor should be considered in terms of the potentials of electronic interconnection, especially as these potentials relate to practical requirements for instructing larger numbers of students, for providing students with unusual academic resources, and for directing students' study.

Academic and administrative personnel in the Oregon State System of Higher Education have also recognized and articulated the need for communication outside the State System, and outside state boundaries, particularly so that they may take advantage of research and administrative developments that may be generated elsewhere.

Educational Specifications

An educational specification, for purposes of this discussion, may be defined as a statement of a job to be accomplished by the educational communications system proposed; a statement in terms of the task and not in terms of specific technology.

A listing of educational specifications can be derived from the foregoing section on Discovered Needs. In the context of the intrastate model, we can list the individual educational specifications pertaining to this study.

A system of electronic interconnection is proposed within the State of Oregon, initially linking the nine institutions of the State System of Higher Education and the State Capitol. By forming the interconnection on this basis, adequate geographic and demographic coverage would be achieved.

This interconnection will be designed to meet the following specific requirements:

1. Permit libraries to exchange materials and information, particularly graphic materials, more rapidly and more efficiently. The State Library at Salem would be included in the interconnection.

2. Allow administrative offices in the Oregon State System of Higher Education (campus-to-campus and Chancellor's Office to campuses) to be in more direct contact with each other. Offices of business affairs, registrars, chief administrators, public affairs and continuing education on each campus would be included under this specification.

3. Provide for exchange of instructional information such as lectures, course segments, and demonstrations, so that faculty members would have access to a broader range of resources and the opportunity for greater utilization of teaching capabilities.

4. Extend the capability of the Office of Independent Study, Division of Continuing Education, to provide lecture and other course information to individual enrollees.

5. Expand transmission capabilities for inter-campus use of electronic data processing equipment in research activities and administrative functions.

6. Allow for individual faculty access, probably through departmental offices, to the Educational Communications System for a variety of transmission and reception uses.

7. Include the Capitol Building at Salem in the basic interconnection system in order to expedite appropriate liaison activities.

In sum, the Educational Communications System intrastate model will be designed with the intent of aiding and encouraging effective communication, using whatever medium is appropriate, throughout the Oregon State System of Higher Education and with related State Government activities.

Further Implications of the Educational Communications System Project in Oregon

Activities in connection with the Educational Communications System (ECS) project in Oregon have resulted in the development of considerable information about projects regarding educational communications in addition to, and apart from, the drafting of a design for an intrastate educational communications system.

While the primary effort has been in the direction of fulfilling the requirement for accomplishing the Oregon intrastate model design, contacts and conversations in conjunction with this effort have led to involvement of the ECS project, to varying degrees, in concurrent and/or related projects within the State of Oregon, particularly in governmental and other Oregon State System of Higher Education activities. Further, at least one privately-supported institution of higher education has expressed a desire to be included in, or at least have access to, the proposed intrastate educational communications system. (Although the primary direction of the Oregon project for ECS has been based on linking institutions of the Oregon State System of Higher Education and the State Capitol, privately-supported institutions of higher education were contacted with a view to informing them of the project, and inquiring of their interest in its development.)

A listing of these concurrent and/or related activities includes:

1. Interinstitutional Committee on Computer Activities, Oregon State System of Higher Education.

2. Department of Finance and Administration, Oregon State Government.

3. Development projects of the School of Engineering, Oregon State University.

4. Technical Services Program.

5. Service planning activities of the Division of Continuing Education, Oregon State System of Higher Education.

6. Post-High School Study Committee.

7. Western Interstate Commission for Higher Education.

Perhaps the closest relationship between the ECS Oregon project and the activities listed above exists with the Interinstitutional Committee on Computer Activities (ICCA). This group has conducted a year-long study of computing and data processing needs of the Oregon State System of Higher Education, culminating in a Preliminary Master Plan. In this Preliminary Master Plan, the ICCA bases the development of communications linkages for computer activity between Oregon campuses on the ECS Intrastate Model design. The aims of the ECS project in Oregon and of the ICCA Master Plan are closely consistent with each other in establishing electronic communications links interconnecting institutions of the Oregon State System of Higher Education. In fact, the ICCA budget item for communications was based on recommendations and information in the Oregon ECS model. Liaison between the ICCA and the ECS Oregon project has resulted in exchange of information, ideas and contacts of mutual benefit. It has resulted in tentative reliance on the implementation of the ECS model in Oregon to bring into operation the plans of the ICCA for computing and data processing in the broad areas of instruction and research, and administration and service.

The Department of Finance and Administration of the State of Oregon, in its outline of "A Unified Information System" for the State of Oregon, cites a heavy flow of information between state organizations, within state departments and between non-state sources and the state. Its Unified Information System would be implemented on the basis of a "federation" of state and locally supervised computer facilities, coordinated by linkage with an Information Index. The report states that "A statewide data communication and switching network . . . seems both desirable and feasible." Several questions remain to be discussed vis-a-vis the mechanics of an intrastate educational communications system, and the State of Oregon Department of Finance and Administration, which administers state-contracted telephonic communications facilities. Some administrative details will also be of concern to the Department, insofar as these affect normal operational and administrative functions of the Department. Some of these questions and details have to do with such things as modification of campus and state capitol switchboards and incoming lines; anticipated volumes and types of usage on ECS lines; feasibility of having separate ECS facilities as part of, or adjacent to, state government facilities; and overall compatibility with other state communications systems. It should be made clear that these are all "nuts and bolts" items, and offer no serious deterrent to overall accomplishments of the intrastate model design. All of the questions that have been raised have been offered in a constructive manner, with full assurance that cooperation and assistance will be available on request.

The School of Engineering, Oregon State University, on April 15, 1966, submitted a proposal for research and/or related activities to the U. S. Commissioner of Education for support through authorization of the Bureau of Research. This proposal was titled "An Investigation of the Feasibility of the Use of Telelecture and Electrowriter Systems to Teach Graduate Engineering Courses at Remote Locations", and makes specific mention of the ECS study findings in Oregon as well as pointing out that systems used in the School of Engineering proposal could easily become part of any intrastate communications system established in Oregon in the future.

A State Technical Services Program, based on Public Law 89-182, the State Technical Services Act of 1965, has been drafted by the Division of Planning and Development, Oregon Department of Commerce, to provide technical services and research information to Oregon business and industry. Projects include a technical information center for dissemination of information on an unlimited range of subjects, and a technical resource service based on development of a data bank of advanced technical and scientific material. One intent of the state program is to "... use computers and other modern methods of communication to make available ... new knowledge being generated by state and federal research." Implications of an intrastate communications system such as the ECS design are readily apparent here.

The Division of Continuing Education, Oregon State System of Higher Education, through its Office of Independent Study, has expressed high interest in the ramifications of an intrastate communications system. Possibilities for utilization of such a system, which could help reduce the gap between the correspondence course student and his instructor and enrich the student's learning experience by presenting course material visually as well as verbally, were stated earlier in this report. Potential use of oral communication in the development of multi-media courses offered by Independent Study has been explored, patterned to a limited degree after the methods of Dial-Access Information Retrieval Systems (DAIRS) now operating on some campuses in other states. Consideration has also been given to the future possibilities of Computer-Assisted Instruction (CAI) for presenting Independent Study course offerings. In both these areas, an intrastate educational communications system would be of primary necessity.

A subcommittee of the State's Educational Coordinating Council, the Post-High School Study Committee, has noted with great interest the developments in connection with the ECS Oregon study as they relate to the potential capability of aiding and encouraging greater flow of information between all institutions of higher education in the state. Included among the concerns of the Post-High School Study Committee are the areas of need and educational specifications cited earlier in this report.

The Western Interstate Commission for Higher Education (WICHE), through its director of special programs in higher education, has expressed a high level of interest in development of an intrastate communications system in Oregon as it might have implications for the total concerns of WICHE. One particular application might be in development of continuing education programs for administrators.

The ECS study in Oregon has implications for privately-supported institutions of higher education. Response from Pacific University in Forest Grove, about twenty miles west of Portland, indicates a strong desire to be included in initial stages of ECS development in Oregon. This point is made with particular reference to library interconnection, but also includes other dimensions of education. Basis for expression of this desire at this point in ECS development rests on the concern that inclusion of privately-supported institutions at a later date would be extremely difficult from the standpoint of obtaining additional funds and also because of other administrative and mechanical factors that might arise if the Oregon project begins to take shape and move along without inclusion of, or provision for, participation by private colleges and universities in Oregon.

Librarians of the Oregon State System of Higher Education, and the State Librarian, have commented favorably on the proposed intrastate communications system. The Ad Hoc Committee on Special Library Service has stated "Every effort should be made to coordinate . . . with the Educational Communications System . . ." The State Librarian feels it "essential" that the Oregon State Library be tied in to any future Educational Communications System, and is "most anxious" to be a part of such a system. The Oregon State Librarian has overlapping responsibility and concern between government and education, and perhaps sees more clearly than most the inherent potentialities of a statewide communications system.

Confronted with the foregoing compilation of plans, projects and commitments, all of which bear some relationship to the ECS project, it would appear that two main conclusions are evident:

1. To a very significant extent, ECS in Oregon has provided impetus for development of ideas and the encouragement of projects underway.

2. Activities in Oregon relating to ECS have progressed to the point where they depend, in varying degrees, on the implementation of the ECS project.

RECOMMENDATIONS

Administrative Design

The ECS Advisory Committee has predicted that the administrative, or management, aspects of ECS will be of central significance. By the nature of the project, this management group is a part of the university structure, with both the university orientation and the technical expertise to work closely with administrators and faculty members on the application of telecommunications techniques to educational problems. This role underlies the various operational tasks listed below.

The following administrative outlines would appear to be appropriate for staffing and functions of Campus ECS Centers and the Statewide ECS Center.

Campus Centers

Staffed by Campus ECS Manager, secretary/traffic clerk, maintenance engineer, part-time assistant; maintain, schedule and install equipment assigned to respective campuses. Staffing and operational requirements of campus centers may vary with individual campuses because of size and purpose, but the following functions would be common: (a) scheduling of equipment use and circuit time; (b) routine adjustments and basic maintenance of equipment; (c) orientation of local faculties and administrations to services available; and (d) with statewide director, plan orderly development and expansion of the system.

Statewide ECS Center

Staffed by Director, chief engineer, secretary/traffic clerk, and perhaps part-time operating technicians; coordinate system scheduling in conjunction with campus center managers, consult and plan for orderly development and expansion of the system. The chief engineer would supervise statewide maintenance of all ECS equipment, train campus technicians, plan the technical development and expansion of the system, and oversee technical operations of the system.

Procedures to be developed for designation of Campus Center staff members should safeguard institutional prerogatives in selection, administrative structure, and coordination activities.

Estimated annual salary, wage and costs for ECS staff members:

Statewide ECS Center

Director	$12,000
Chief Engineer	8,400
Secretary/Traffic Clerk	4,200
Part-time wages	6,000
Travel, Supplies and Expenses	5,000
Total	$35,600

Campus ECS Center

Manager	$ 9,800
Maintenance Engineer	6,500
Secretary/Traffic Clerk	4,000
Part-time Wages	4,500
Travel, Supplies and Expenses	3,000
	$27,800
(9 campuses)	X9
Total	$250,200

Estimated annual administrative costs:

$285,800

It is estimated that space requirements will be approximately 1000 sq. ft. for the Statewide ECS Center and 500-600 sq. ft. for each of the Campus ECS Centers. It is anticipated that existing arrangements, under which space is provided at no cost to the project, could be continued and expanded at the institutions involved to meet the above requirements.

Technical Design

It will be seen that, as in the previous engineering section, a "two-layer" technical design was developed, to provide for leased Telpak service or for broadband microwave transmission.

Our present purpose is to describe some operational details of any proposed system.

All channelization options must have an administrative/service channel as a constant. Further, as a basic part of the system's design, there must be the capacity to control traffic to all stations on the system from a central point, thereby placing a bare minimum of reliance on human dependability at the various stations. In addition, each campus, through its own ECS central office, should have switching and channelization control for origination and reception of broadband transmissions.

It is expected that all ECS lines to campus points of termination would go through existing campus switchboard facilities. In the cases of the State Library and Capitol Building in Salem, terminal points for ECS lines would go through the Capitol switchboard.

Each library in the Oregon State System of Higher Education and the State Library would have facsimile sending and receiving units as basic permanent installations. Each campus would have a teletype as a basic permanent installation in an appropriate location, probably in the registrar's/admissions office, to provide for administrative coordination and handling administrative traffic during peak need times.

At strategic points on each campus, probably offices of major departments and/or schools, ECS lines from the campus switchboard would terminate in blocks to which appropriate pieces of equipment may be attached on demand. These terminal blocks would be designed to permit conversation plus mechanical transmission of information.

Initial requirements for additional switchboard lines from campus and Capitol switchboards to provide ECS accessibility via terminal blocks are indicated below.

University of Oregon	20[a]
Oregon State University	19
Portland State College	15[b]
Oregon College of Education	12
Southern Oregon College	12
Oregon Technical Institute	12
Eastern Oregon College	12
U/O Medical School	6
U/O Dental School	6
Salem (Capitol)	4[c]

[a] Includes two terminal blocks for Chancellor's office

[b] Includes terminal block in Portland data processing center on Portland State College campus

[c] Includes terminal blocks for two Continuing Education office locations, Capitol Building and State Library

All totals include major departments and/or schools, and the following separate office functions: President's office, business affairs, continuing education, public affairs, registrar/admissions, libraries and campus ECS centers.

Besides permanent basic equipment installations called for above, individual faculty members would have access to the educational communications system by means of a central pool of communications equipment located in an appropriate place on each campus. This equipment would be available on demand for use of the individual faculty member in his instructional, research, and other academic activities. In the Salem portion of the model, equipment would be located in the State System broadcasting studios (basement, Capitol Building) and in the Division of Continuing Education offices (Finance Building).

Campus ECS centers would also have equipment "on line" for traffic which does not require an individual installation, and provide for delivery of information received at the center. Each center would also have transmission capability for outgoing traffic, as well.

Estimated inventory of terminal facilities needed for campus and Capitol ECS use, including permanent basic installations and equipment "on line" at ECS centers:

	Facsimile	Teletype	Data phone	Telelecture/ Electrowriter	Slow-scan TV
U. of Oregon	5	5	3	3	2
Oregon State U.	4	4	3	2	2
Portland State C.	4	4	3	2	0
Oregon College of Education	3	3	2	1	0
Southern Oregon C.	3	3	2	1	0
Oregon Technical Institute	3	3	2	1	0
Eastern Oregon C.	3	3	2	1	0
U/O Medical School	3	3	2	1	0
U/O Dental School	3	3	2	1	0
Salem (Capitol)	3	2	1	1	-
	34	33	22	14	4

Inclusion of a slow-scan TV system initially linking the University of Oregon and Oregon State University is expected to provide adequate opportunity to obtain first-hand experience in the utilization of these relatively new devices. Each institution would be equipped with one transmit scan converter and one receive scan converter, thereby providing duplex capability. The initial location of the units is arbitrary, except that the location of one end of the system in the Statewide ECS Center (conditionally on the Oregon State University campus) is desirable from the standpoints of supervision and evaluation by the statewide ECS staff. The other end of the slow-scan TV system is conceived of as being experimentally located at a number of institutions during the trial operation period, as requests for use and procedures of evaluation will probably dictate its movement from one campus to another.

Transmission facilities for this model are based on alternative plans for Telpak "A" land line systems or a broadband microwave transmission system. In the event that it seemed advisable to go to a broadband microwave system, a second microwave network linking Eugene, Corvallis, Salem-Monmouth, and Portland could be established, paralleling already existing microwave network facilities. Such a parallel system would have the cost reduction advantage of utilizing already-established sites, negating need for acquisition of land, towers, access, power, etc.

CONCLUSION

This report, in the form of a draft proposal for a working model of an intrastate educational communications system, has been prepared on the basis of information, requirements, and desires bearing on the need for educational communications in the Oregon State System of Higher Education.

The principal effort has been to attack presently perceived problems with presently available technology. A second concern has been the abiding awareness that presently perceived problems certainly do not represent the requirements of five years hence; therefore, consideration must be given to a flexible and expandable system which can accommodate changing and growing needs as its constituency and available technology both develop. Future planning by all concerned must also take into account technical and operational relationships between State Government and Oregon State System of Higher Education facilities, both existing and planned, and common carriers such as those operated by the Bell System and various microwave relay companies.

TECHNICAL DESIGN
for
THE INTRASTATE (OREGON) MODEL
EDUCATIONAL COMMUNICATIONS SYSTEM

William J. Kessler

GENERAL

The general system design for the Intrastate (Oregon) Model is similar to the design of the Interstate Midwest Model in that Telpak A (or equivalent) intercity transmission facilities are provided between the state institutions of higher education. As in the Midwest Model, the Telpak A transmission facilities are available either as multiple Telephone/Narrow band Data or a single Broadband/Data facility at the user's option.

The Oregon Model Educational Communications System consists of a statewide ECS Control Center located in or near Monmouth or the campus of the Oregon College of Education as well as individual campus ECS Centers as outlined in the Oregon Model Educational Specifications.

As in the Midwest Model, the campus ECS Center may be combined with the statewide ECS Control Center on the network center campus.

Although the mileage chart shown in Figure 28 discloses that selection of Monmouth as the location for the statewide ECS Control Center results in lower intercity Telpak mileage charges, it may be desirable to consider either Corvallis (Oregon State University) or Salem (state capitol) as the central location at only slightly increased monthly costs.

The selection of Corvallis as the site of the statewide Control Center increases the monthly interconnection cost \$96.50 per month (\$1950-\$1853.50). The selection of Salem as the site of the control center would increase the monthly interconnection cost \$56.60 per month (\$1910.10-\$1853.50).

Figures showing typical schematic diagrams of the proposed statewide ECS Control Center and the individual Campus ECS Centers are not included in this report since they are similar to corresponding control centers shown in Figures 6 and 7 of the Interstate (Midwest) Model Engineering Report. One exception in the Oregon Model is that the campus ECS Centers do not include (at least initially) a Chairman's Conference Console described in the Midwest Educational Specifications and Engineering Report.

OREGON MODEL FEATURES

The unique features of the Oregon Model Educational Communications System include the following:

1. Slow-scan television transmission capabilities.

2. The use of Subsidiary Communications Authorization (SCA) on the Educational FM station KOAP-FM operating in Portland, Oregon.

3. The use of a single full duplex tie line or WATS circuit connecting to the Telpak circuits to provide an interconnection with those institutions of higher education which are either remotely located or cannot justify initially the use of a full Telpak A transmission facility.

1. SLOW-SCAN TELEVISION TRANSMISSION

Slow-scan television transmission involves the use of scan converters to permit changing television scanning standards from the standard 30 frames per second (used to display rapid motion) to a lower rate of one frame per minute to permit the transmission of "television stills" over low-cost telephone circuits or ordinary radio (AM or FM) transmitters.

A transmitting scan converter at the originating point converts the 30 frames per second (which normally requires a wide-band television channel for transmission) into one frame per minute which permits the transmission of still pictures of equivalent detail over a voice-grade telephone circuit. A reverse scan converter at the destination point converts the one frame per minute back into the 30 frames per second scanning standards so that still pictures can be displayed at the rate of one per minute on conventional television monitors or receivers.

A complete survey of scan-conversion equipment discloses that two types have emerged from the laboratory suitable for operational use and available for delivery by spring 1967.

This equipment is the Videx BV-400 and BV-407 transmitting and receiving consoles developed by the ITT Industrial Laboratories of Fort Wayne, Indiana, and the "Blackboard-by-wire" system developed by the Sylvania subsidiary of the General Telephone and Electronics Co. The "Blackboard-by-wire" system is restricted to the transmission of those graphics which can be generated by a pen or stylus. As such, it is ideal for the transmission of sketches, formulae or anything that can be written or drawn on a blackboard. The remote display is by means of a standard television receiver or monitor and thus involves scan conversion at the receiving end. The "Blackboard-by-wire" system is, at this stage, considerably cheaper than the Videx system but obviously not as versatile. The ITT Videx system will transmit and display any image or picture that television is capable of handling but at a much slower rate as a sequence of stills.

The price of the ITT Videx is in the neighborhood of $10,000 for each receiving and transmitting unit while the Sylvania Blackboard-by-wire will sell for approximately $5,000 per unit.

2. SUBSIDIARY COMMUNICATIONS AUTHORIZATIONS

Subsidiary Communications Authorizations, known as SCA, is a subcarrier technique for providing additional broadcast channels on an FM transmitter using the same technology which makes FM Stereo broadcasting possible.

This technique is under consideration for the Oregon Model with the FM transmitter KOAP-FM in Portland. The ten kilowatt transmitter currently in use at KOAP-FM is a Westinghouse Model FM-10. This is an early-vintage FM transmitter which exhibits an unstable exciter which would have to be replaced before going to SCA operation. The exact cost of making the conversion would range from $3,000 to $10,000 depending on the exact nature of the problems (which have not been fully explored at this stage of the study) encountered in converting to SCA operation and obtaining FCC type acceptance.

Two SCA channels would permit the transmission of a lecture accompanied by electrowriter, facsimile, or slow-scan television transmissions in addition to the regular FM program channel over a coverage area around Portland shown in Figure 29.

3. DUPLEX TIE-LINE FACILITIES

The geographical locations and initial circuit requirements of Eastern Oregon College in La Grande, Southern Oregon College in Ashland and Oregon Technical Institute in Klamath Falls do not at this time justify the use of Telpak channels. Accordingly, the educational specifications for the Oregon Model define a need for a single duplex Tie-line or WATS line from the switchboard at Eastern Oregon College at La Grande to a Telpak line terminating in Portland as well as similar tie-lines from Klamath Falls to Eugene and from Ashland to Eugene.

In the state of Oregon, the tariff rate on a duplex tie line is $3.00 per mile per month and $575.00 per month for an intrastate WATS line. Therefore, WATS lines are recommended for those institutions more than 190 miles from the nearest Telpak trunk. Accordingly, a WATS line is recommended for Eastern Oregon College in La Grande and duplex tie lines for Oregon Technical Institute in Klamath Falls and Southern Oregon College in Ashland to a Telpak termination in Eugene. The monthly costs for these lines are included in the total intercity connection costs.

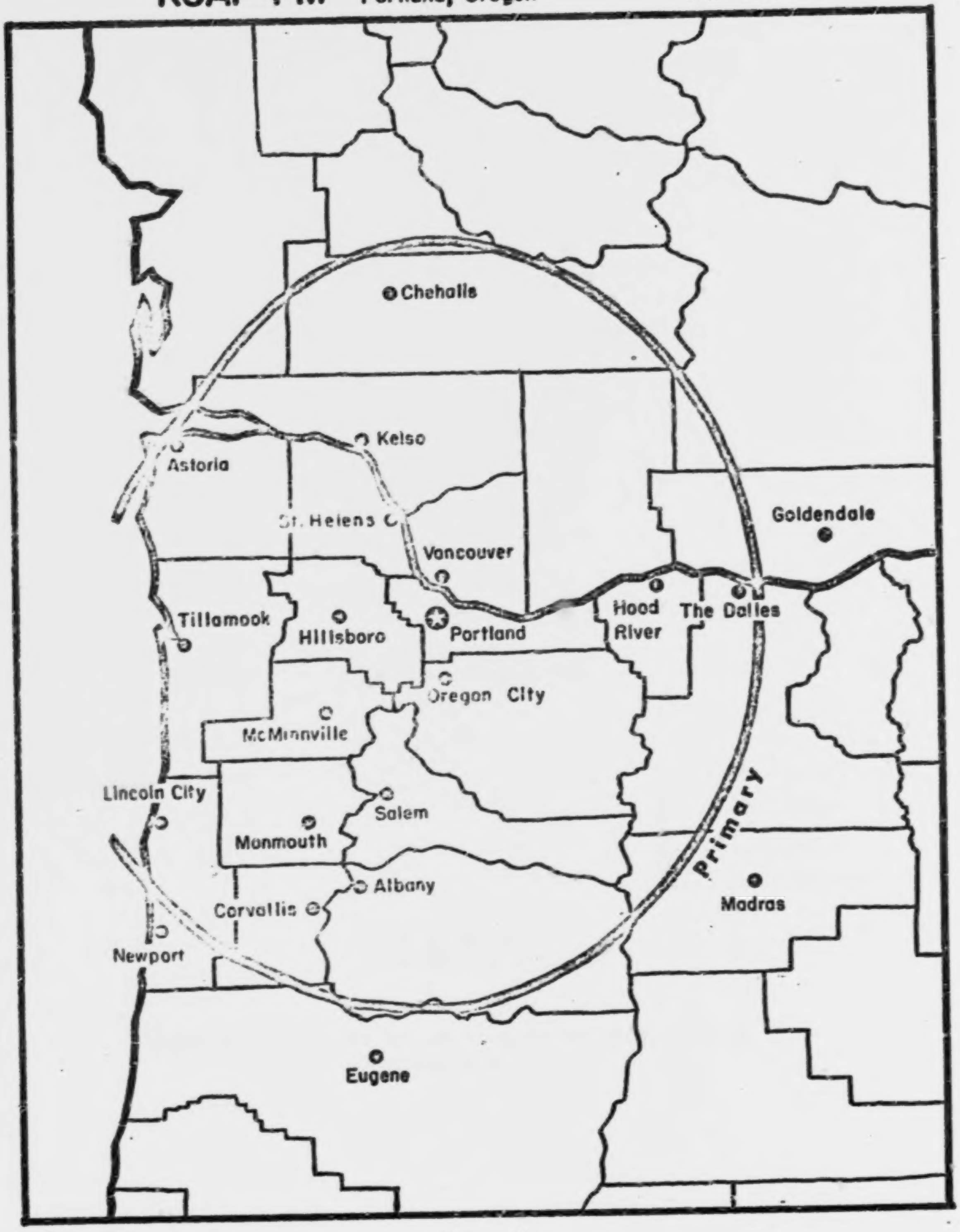
4. EXISTING MICROWAVE FACILITIES

The State of Oregon currently operates a television and radio microwave interconnection facility as shown in the attached Figure 30. The immediate possibility of providing additional channels of communications as subcarriers on the TV relay link was rejected after it was learned that the base bandwidth of the Motorola microwave relay equipment is not adequate to accommodate additional subcarriers without serious intermodulation distortion problems.

Consequently, completion of the ECS Phase III study of the Oregon Model revealed that one of the best ways to expand or develop the existing Oregon microwave facilities would be to add a separate wide band duplex microwave channel to the existing facilities. In this way considerable transmission spectrum space along the existing routing from Eugene to Portland could be made available economically by making effective use of much of the existing facilities such as equipment sites, buildings, towers, etc. Figures 31 through 33 summarize the cost estimates for a full duplex microwave channel providing eight megacycles of base bandwidth which could be multiplexed to provide additional duplex communications channels as needed or a two-way TV channel with program audio as well as a limited number of duplex communication/data channels.

	Portland	Salem	Monmouth	Corvallis	Eugene
Portland	0	45.0	54.0	73.0	106.0
Salem	45	0	11.3	28.5	64.0
Monmouth	54	11.3	0	19.5	56.4
Corvallis	73	28.5	19.5	0	37.5
Eugene	106	64.0	56.4	37.5	0
TOTALS	278	148.8	141.2	158.5	263.9

INTERCITY TELPAK MILEAGE CHART
FIGURE 29



KOAP-FM Portland, Oregon 91.5 mc

Chehalis
Kelso
Astoria
St. Helens
Vancouver
Goldendale
Hood River
The Dalles
Tillamook
Hillsboro
Portland
Oregon City
McMinnville
Lincoln City
Salem
Monmouth
Primary
Albany
Corvallis
Madras
Newport
Eugene

Figure 29

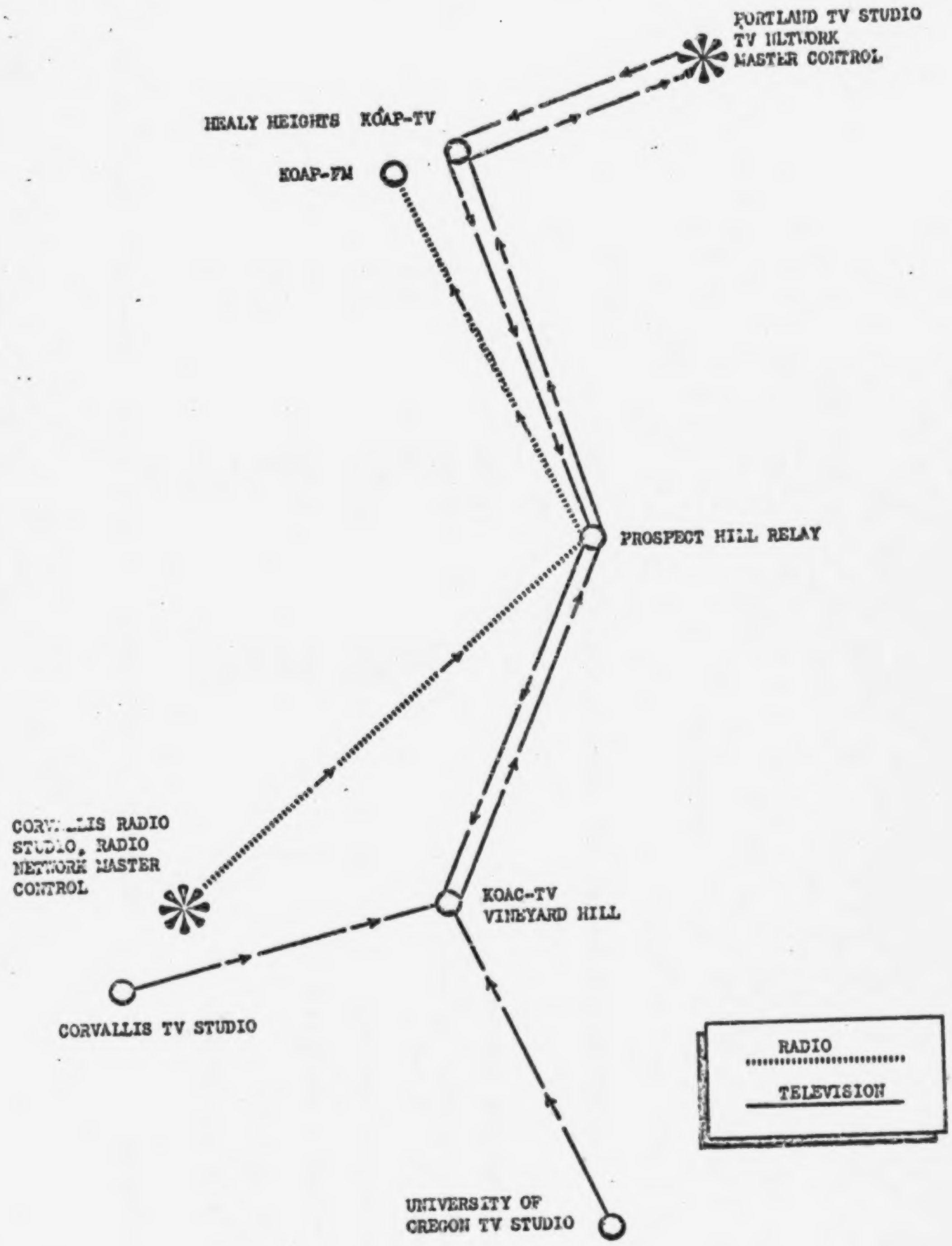

PORTLAND TV STUDIO
TV NETWORK
MASTER CONTROL
HEALY HEIGHTS KOAP-TV
KOAP-FM
PROSPECT HILL RELAY
CORVALLIS RADIO
STUDIO, RADIO
NETWORK MASTER
CONTROL
KOAC-TV
VINEYARD HILL
CORVALLIS TV STUDIO
RADIO
TELEVISION
UNIVERSITY OF
OREGON TV STUDIO

FIGURE 30: EXISTING OREGON EDUCATIONAL BROADCASTING MICROWAVE ROUTES

ITEM	DESCRIPTION	QUANTITY	UNIT COST	TOTAL COST (A)	% MAINT.	ANNUAL MAINT (B)
1	10' Parabolic dish and feedhorn	1	915	915	2.0	18
2	Radome for 10' dish	1	400	400	2.0	8
3	Tower mount for 10' dish	1	140	140	2.0	3
4	Waveguide run	1	1,228	1,228	2.0	24
5	Pressurized automatic dehydrator	1	600	600	2.0	12
6	Microwave transmitter/receiver	1	6,846	6,846	4.5	308
7	Service channel	1	863	863	4.5	39
8	10 alarm remote fault alarm	1	990	990	4.5	45
9	Battery plant and charger - 50 amp hours	1	1,320	1,320	4.5	594
	TOTALS FOR END TERMINAL			13,302		1,051

MICROWAVE END-TERMINAL EQUIPMENT AT PORTLAND AND EUGENE

FIGURE 31

ITEM	DESCRIPTION	QUANTITY	UNIT COST	TOTAL COST (A)	% MAINT.	ANNUAL MAINT. (B)
1	10' parabolic dish and feedhorn	2	915	1,830	2.0	37
2	Radome for 10' dish	2	400	800	2.0	16
3	Tower mount for 10' dish	2	140	280	2.0	6
4	Waveguide run	2	1,128	2,456	2.0	49
5	Pressurized automatic dehydrator	2	600	600	2.0	12
6	Duplex Heterodyne microwave relay	1	21,925	43,850	4.5	987
7	Service channel	1	1,433	1,433	4.5	65
8	10 alarm remote fault alarm	1	990	990	4.5	45
9	Battery plant and charger - 50 amp hours	1	1,320	1,320	4.5	594
	TOTALS FOR HETERODYNE RELAY			53,559		1,811

MICROWAVE REPEATER EQUIPMENT AT PROSPECT HILL AND VINEYARD HILL

FIGURE 32

ITEM	DESCRIPTION	REFERENCE	QUANTITY	TOTAL COST (A)	ANNUAL MAINT. (B)
1	End-Terminal Microwave Equipment	Figure 31	2	$26,604	$2,102
2	Repeater Microwave Equipment	Figure 32	2	107,118	3,622
	Subtotal			133,722	5,724
3	Final Engineering Supervision, path calculations, etc. @15% of Capital Outlay			20,058	
4	Annual Interest at 6% of Capital Outlay				8,023
	Total			153,780	13,747

Microwave Carrier Equipment Cost = A + n B

= 153,780 + n13,747

where n = number of years of operation.

SUMMARY OF END TERMINAL AND REPEATER MICROWAVE CARRIER COSTS

FIGURE 33

5. LIMITED COMMON-CARRIER FACILITIES

A number of limited common carrier companies are in operation in the State of Oregon, providing transmission of television programs to numerous CATV distribution systems. Typical of these are:

1. High Desert Microwave, Burns, Oregon

2. Telecommunications of Oregon, Inc. La Grande, Oregon

3. Pacific Teletronics, Inc.

A detailed study of the transmission facilities available through the above limited carriers has not been made. However, it is known that much of the routing involves one-way television transmission and is thus not suitable for duplex communications without undertaking additional construction of relay and terminal facilities.

TOTAL TELPAK COMMUNICATIONS SYSTEM COST

The total cost estimate of the Intrastate (Oregon) Model Communications System may be established by summing the component costs, as was done for the Midwest Model. The component costs are:

1. The total intercity Telpak network charge (Figure 34).

2. The total termination/terminal equipment charge for the capitol and each campus ECS center (Figures 35-44).

3. The total termination/terminal equipment charge for the statewide ECS Control Center (Figure 45).

4. The total local-to-switchboard charges (Figure 46).

The total non-recurrent and recurrent monthly charges for the four categories above are tabulated in Figure 47.

Thus the total of the communications system for n months reduces to the form:

$$\text{TOTAL COST FOR } n \text{ MONTHS} = \Sigma A + n\,\Sigma B \qquad (1)$$

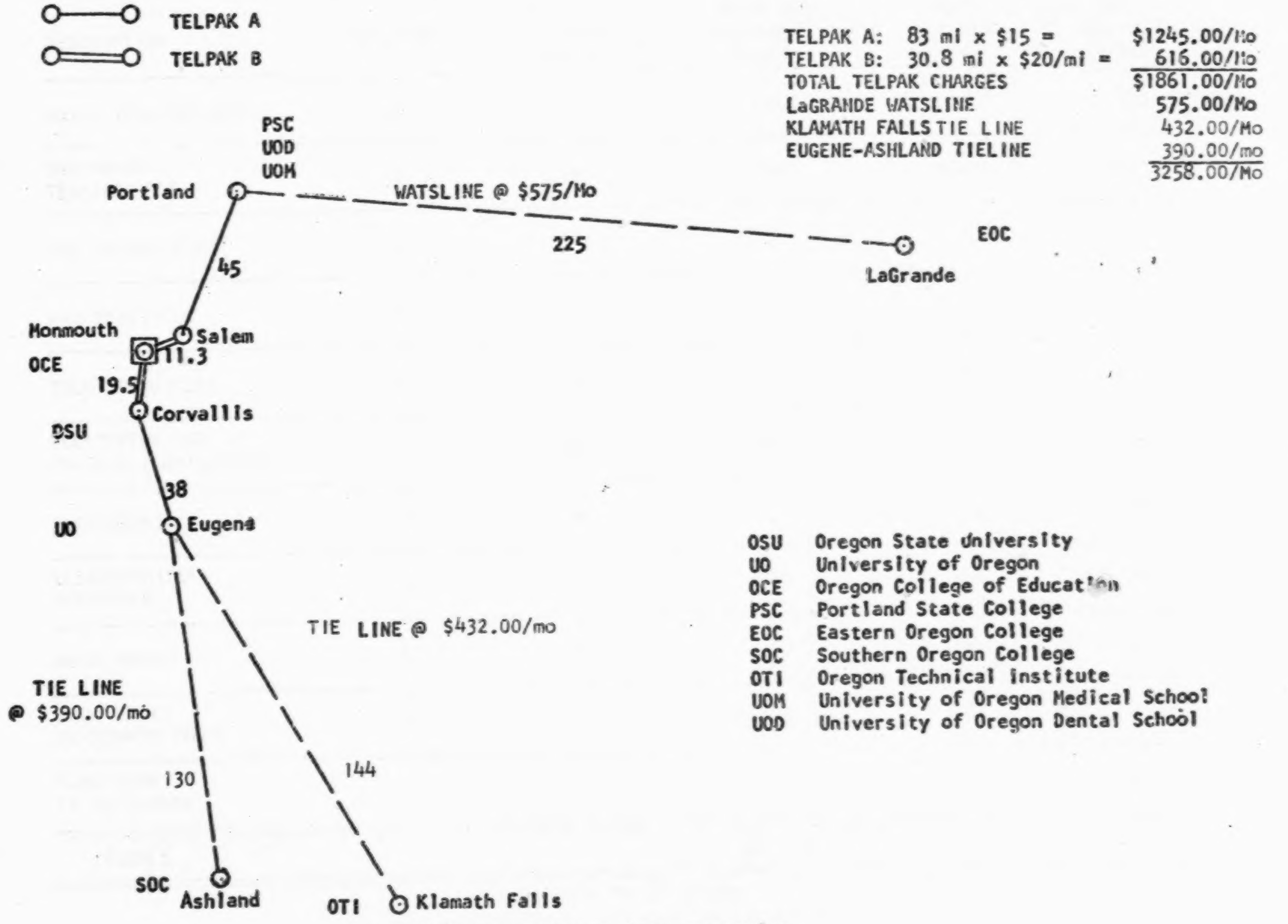
where A is the total non-recurrent charge
and B is the total recurrent monthly charge.

Taking the totals for A and B in Figure 47 and substituting in equation (1) yields the final form as equation (2).

$$\text{TOTAL COST FOR n MONTHS} = 6{,}052 + n\ 27{,}603 \qquad (2)$$

Perhaps one of the most significant changes that may be made in the Oregon Model Proposal during Phase IV is the possibility of combining the future **Telpak** requirements of the state universities with the General Services Administration (GSA) under the shared Telpak Tariff structure. This is an avenue of approach in which considerable negotiations remain to be carried out. However, it must be recognized that the courts may render a decision before Phase IV can be implemented that the existing Telpak tariff must be increased to render them fully compensatory and thus consistent with the cost of providing the other services provided by the common carriers.

Such a development would of course provide a compelling reason for combining ECS Telpak requirements with GSA in order to keep the circuit cost down to the lowest possible minimum.


TELPAK A
TELPAK B
PSC
UOD
UOM
Portland
WATSLINE @ $575/Mo
225
EOC
LaGrande
45
Monmouth
OCE
Salem
11.3
19.5
Corvallis
OSU
38
UO
Eugene
TIE LINE @ $432.00/mo
TIE LINE
@ $390.00/mo
130
144
SOC
Ashland
OTI
Klamath Falls

TELPAK A: 83 mi x $15 =	$1245.00/Mo
TELPAK B: 30.8 mi x $20/mi =	616.00/Mo
TOTAL TELPAK CHARGES	$1861.00/Mo
LaGRANDE WATSLINE	575.00/Mo
KLAMATH FALLS TIE LINE	432.00/Mo
EUGENE-ASHLAND TIELINE	390.00/mo
	3258.00/Mo

OSU	Oregon State University
UO	University of Oregon
OCE	Oregon College of Education
PSC	Portland State College
EOC	Eastern Oregon College
SOC	Southern Oregon College
OTI	Oregon Technical Institute
UOM	University of Oregon Medical School
UOD	University of Oregon Dental School

Proposed State of Oregon Interconnection
Figure 34

DESCRIPTION	QUANTITY	UNIT NON-RECURRENT CHARGE	TOTAL NON-RECURRENT CHARGE	UNIT MONTHLY CHARGE	TOTAL MONTHLY CHARGE
VOICE TERMINATIONS	12	10	120	15	180
BROADBAND TERMINATIONS	1	70	70	100	100
FAX TRANSMITTERS	5	-	-	115	575
FAX RECEIVERS	5	-	-	105	525
TELETYPEWRITERS	5	25	125	50	250
TELETYPEWRITER CHANNEL TERMINATIONS	5	25	125	25	125
ELECTROWRITER	3	38	114	40	120
ELECTROWRITER INTERFACE	3	15	45	8	24
DATA PHONES	3	25	75	40	120
SLOW SCAN TV TRANSMITTERS	1	-	-	330	330
SLOW SCAN TV RECEIVERS	1	-	-	330	330
TOTALS			$674.00		$2679.00

UNIVERSITY OF OREGON
ECS CENTER LEASED TERMINAL EQUIPMENT COSTS
Figure 35

DESCRIPTION	QUANTITY	UNIT NON-RECURRENT CHARGE	TOTAL NON-RECURRENT CHARGE	UNIT MONTHLY CHARGE	TOTAL MONTHLY CHARGE
VOICE TERMINATIONS	12	10	120	15	180
BROADBAND TERMINATIONS	1	70	70	100	100
FAX TRANSMITTERS	4	-	-	115	460
FAX RECEIVERS	4	-	-	105	420
TELETYPEWRITERS	4	25	100	50	200
TELETYPEWRITER CHANNEL TERMINATIONS	4	25	100	25	100
ELECTROWRITER	2	38	76	40	80
ELECTROWRITER INTERFACE	2	15	30	8	16
DATA PHONES	3	25	75	40	120
SLOW SCAN TV TRANSMITTERS	1	-	-	330	330
SLOW SCAN TV RECEIVERS	1	-	-	330	330
TOTALS			$571.00		$2336.00

OREGON STATE UNIVERSITY
ECS CENTER LEASED TERMINAL EQUIPMENT COSTS
Figure 36

DESCRIPTION	QUANTITY	UNIT NON-RECURRENT CHARGE	TOTAL NON-RECURRENT CHARGE	UNIT MONTHLY CHARGE	TOTAL MONTHLY CHARGE
VOICE TERMINATIONS	4	10	40	15	60
BROADBAND TERMINATIONS	1	70	70	100	100
FAX TRANSMITTERS	4	-	-	115	460
FAX RECEIVERS	4	-	-	105	420
TELETYPEWRITERS	4	25	100	50	200
TELETYPEWRITER CHANNEL TERMINATIONS	4	25	100	25	100
ELECTROWRITER	2	38	76	40	80
ELECTROWRITER INTERFACE	2	15	30	8	16
DATA PHONES	3	25	75	40	120
TOTALS			$491.00		$1556.00

PORTLAND STATE COLLEGE
ECS CENTER LEASED TERMINAL EQUIPMENT COSTS
Figure 37

DESCRIPTION	QUANTITY	UNIT NON-RECURRENT CHARGE	TOTAL NON-RECURRENT CHARGE	UNIT MONTHLY CHARGE	TOTAL MONTHLY CHARGE
VOICE TERMINATIONS	12	10	120	15	180
BROADBAND TERMINATIONS	0	70	0	100	0
FAX TRANSMITTERS	3	-	-	115	345
FAX RECEIVERS	3	-	-	105	315
TELETYPEWRITERS	3	25	75	50	150
TELETYPEWRITER CHANNEL TERMINATIONS	3	25	75	25	75
ELECTROWRITER	1	38	38	40	40
ELECTROWRITER INTERFACE	1	15	15	8	8
DATA PHONES	2	25	50	40	80
TOTALS			$373.00		$1185.00

OREGON COLLEGE OF EDUCATION
ECS CENTER LEASED TERMINAL EQUIPMENT COSTS
Figure 38

DESCRIPTION	QUANTITY	UNIT NON-RECURRENT CHARGE	TOTAL NON-RECURRENT CHARGE	UNIT MONTHLY CHARGE	TOTAL MONTHLY CHARGE
VOICE TERMINATIONS	1	10	10	15	15
BROADBAND TERMINATIONS	0	70	0	100	0
FAX TRANSMITTERS	3	-	-	115	345
FAX RECEIVERS	3	-	-	105	315
TELETYPEWRITERS	3	25	75	50	150
TELETYPEWRITER CHANNEL TERMINATIONS	3	25	75	25	75
ELECTROWRITER	1	38	38	40	40
ELECTROWRITER INTERFACE	1	15	15	8	8
DATA PHONES	2	25	50	40	80
TOTALS			$263.00		$1028.00

SOUTHERN OREGON COLLEGE
ECS CENTER LEASED TERMINAL EQUIPMENT COSTS
Figure 39

DESCRIPTION	QUANTITY	UNIT NON-RECURRENT CHARGE	TOTAL NON-RECURRENT CHARGE	UNIT MONTHLY CHARGE	TOTAL MONTHLY CHARGE
VOICE TERMINATIONS	1	10	10	15	15
BROADBAND TERMINATIONS	0	70	0	100	0
FAX TRANSMITTERS	3	-	-	115	345
FAX RECEIVERS	3	-	-	105	315
TELETYPEWRITERS	3	25	75	50	150
TELETYPEWRITER CHANNEL TERMINATIONS	3	25	75	25	75
ELECTROWRITER	1	38	38	40	40
ELECTROWRITER INTERFACE	1	15	15	8	8
DATA PHONES	2	25	50	40	80
TOTALS			$263.00		$1028.00

OREGON TECHNICAL INSTITUTE
ECS CENTER LEASED TERMINAL EQUIPMENT COSTS
Figure 40

DESCRIPTION	QUANTITY	UNIT NON-RECURRENT CHARGE	TOTAL NON-RECURRENT CHARGE	UNIT MONTHLY CHARGE	TOTAL MONTHLY CHARGE
VOICE TERMINATIONS	1	10	10	15	15
BROADBAND TERMINATIONS	0	70	0	100	0
FAX TRANSMITTERS	3	-	-	115	345
FAX RECEIVERS	3	-	-	105	315
TELETYPEWRITERS	3	25	75	50	150
TELETYPEWRITER CHANNEL TERMINATIONS	3	25	75	25	75
ELECTROWRITER	1	38	38	40	40
ELECTROWRITER INTERFACE	1	15	15	8	8
DATA PHONES	2	25	50	40	80
TOTALS			$263.00		$1028.00

EASTERN OREGON COLLEGE
ECS CENTER LEASED TERMINAL EQUIPMENT COSTS
Figure 41

DESCRIPTION	QUANTITY	UNIT NON-RECURRENT CHARGE	TOTAL NON-RECURRENT CHARGE	UNIT MONTHLY CHARGE	TOTAL MONTHLY CHARGE
VOICE TERMINATIONS	4	10	40	15	60
BROADBAND TERMINATIONS	0	70	0	100	0
FAX TRANSMITTERS	3	-	-	115	345
FAX RECEIVERS	3	-	-	105	315
TELETYPEWRITERS	3	25	75	50	150
TELETYPEWRITER CHANNEL TERMINATIONS	3	25	75	25	75
ELECTROWRITER	1	38	38	40	40
ELECTROWRITER INTERFACE	1	15	15	8	8
DATA PHONES	2	25	50	40	80
TOTALS			$293.00		$1073.00

UNIVERSITY OF OREGON MEDICAL SCHOOL
ECS CENTER LEASED TERMINAL EQUIPMENT COSTS
Figure 42

DESCRIPTION	QUANTITY	UNIT NON-RECURRENT CHARGE	TOTAL NON-RECURRENT CHARGE	UNIT MONTHLY CHARGE	TOTAL MONTHLY CHARGE
VOICE TERMINATIONS	4	10	40	15	60
BROADBAND TERMINATIONS	0	70	0	100	0
FAX TRANSMITTERS	3	-	-	115	345
FAX RECEIVERS	3	-	-	105	315
TELETYPEWRITERS	3	25	75	50	150
TELETYPEWRITER CHANNEL TERMINATIONS	3	25	75	25	75
ELECTROWRITER	1	38	38	40	40
ELECTROWRITER INTERFACE	1	15	15	8	8
DATA PHONES	2	25	50	40	80
TOTALS			$293.00		$1073.00

UNIVERSITY OF OREGON DENTAL SCHOOL
ECS CENTER LEASED TERMINAL EQUIPMENT COSTS
Figure 43

DESCRIPTION	QUANTITY	UNIT NON-RECURRENT CHARGE	TOTAL NON-RECURRENT CHARGE	UNIT MONTHLY CHARGE	TOTAL MONTHLY CHARGE
VOICE TERMINATIONS	12	10	120	15	180
BROADBAND TERMINATIONS	1	70	70	100	100
FAX TRANSMITTERS	3	-	-	115	345
FAX RECEIVERS	3	-	-	105	315
TELETYPEWRITERS	2	25	50	50	100
TELETYPEWRITER CHANNEL TERMINATIONS	2	25	50	25	50
ELECTROWRITER	1	38	38	40	40
ELECTROWRITER INTERFACE	1	15	15	8	8
DATA PHONES	1	25	25	40	40
TOTALS			$368.00		$1178.00

SALEM
ECS CENTER LEASED TERMINAL EQUIPMENT COSTS
Figure 44

Description	Quantity	Unit non-recurrent charge	Total non-recurrent charge	Unit monthly charge	Total monthly charge
Pax Dial Exchange	1	575.00	575.00	500.00	500.00
Voice Terminations	60	10.00	600.00	15.00	900.00
12 x 12 crossbar broad-band switcher	1	100.00	100.00	150.00	150.00
1 x 12 broadband switcher	2	10.00	20.00	25.00	50.00
2 x 2 narrow band switcher	1	10.00	10.00	25.00	50.00
Broadband Terminations	4	70.00	280.00	100.00	400.00
TOTALS			$1,585.00		$2,050.00

STATE ECS CONTROL CENTER LEASED TERMINAL EQUIPMENT COSTS

Figure 45

Description	Quantity	Unit non-recurrent charge	Total non-recurrent charge	Unit monthly* charge	Total monthly charge
University of Oregon	20	5.00	100.00	10.00	200.00
Oregon State University	19	"	95.00	"	190.00
Portland State College	15	"	75.00	"	150.00
Oregon College of Education	12	"	60.00	"	120.00
Southern Oregon College	12	"	60.00	"	120.00
Oregon Technical Institute	12	"	60.00	"	120.00
Eastern Oregon College	12	"	60.00	"	120.00
U/O Medical College	6	"	30.00	"	60.00
U/O Dental School	6	"	30.00	"	60.00
Salem, Oregon (Capital Bldg.)	4	"	20.00	"	40.00
TOTALS			$590.00		$1,180.00

*Average figures

LOCAL TERMINATIONS TO SWITCHBOARDS

Figure 46

Item	Data Source	Non-Recurrent Charge (A)	Recurrent Monthly Charge (B)
Total Network Interconnection charge	Figure 34	---	3,601.00
University of Oregon Term. Eqpt. charge	" 35	674.00	2,679.00
Oregon State Univ. " " "	" 36	571.00	2,336.00
Portland State Col. " " "	" 37	491.00	1,556.00
Oregon Col. of Ed. " " "	" 38	373.00	1,185.00
Sou. Oregon College " " "	" 39	263.00	1,028.00
Oregon Tech. Inst. " " "	" 40	263.00	1,028.00
Eastern Oregon Col. " " "	" 41	263.00	1,028.00
U/O Medical School " " "	" 42	293.00	1,073.00
U/O Dental School " " "	" 43	293.00	1,073.00
Salem (Capital) " " "	" 44	368.00	1,178.00
State ECS Control Center" " "	" 45	1,610.00	2,050.00
Total Local " " "	" 46	590.00	1,180.00
TOTAL		6,052.00	20,995

TOTAL COST FOR N MONTHS $= \Sigma A + n\Sigma B = 6{,}052.00 + n20{,}995$

TOTAL TELPAK LEASED COST SUMMARY

Figure 47

EDUCATIONAL COMMUNICATIONS SYSTEM
EDUCATIONAL RESOURCES MODEL

Harold W. Roeth

EDUCATIONAL RESOURCES MODEL

INTRODUCTION

In the discussion and planning of the many proposals for communications networks, whether they be for a single purpose such as television, or for many purposes, as envisioned by the Educational Communications System, there is a need to consider carefully the question of just what communications, or "messages", will be carried by the network, and who will be the senders and receivers of these messages. These questions are, by far, the most significant ones that have to be answered, and they transcend the technical and mechanical aspects of network planning. Too often, the technical and mechanical problems of building a network become the major concern of the planners. Great efforts are spent on the design of the technical system at the expense of adequate planning for the contents of the system. While extensive and accurate technical analysis and design are vital elements of any proposal, it should be apparent that today, given a small amount of time and a large amount of money, the communications industry is well equipped to create any technical system that a communications network will require. But technology cannot and should not determine the purposes of a communications system. This is accomplished by applying "user" design, by working with the potential users to determine what they want from such a system and how they will use it.

Within the specific institutions that are part of the Midwest and Oregon models, key staff and faculty members have become, in effect, working members of the ECS planning staff by being asked to indicate how they would use a wideband, multi-purpose communications system. Many ideas and proposals were obtained, and other staff and faculty members were then asked to evaluate and comment on these proposals. This procedure is explained in greater detail earlier in this report, but it is outlined briefly here to indicate how the philosophy of "user" design fits into the goals of the Educational Resources Model, and why the results of this model obtained during Phase III will be a vital part of the operational phase of ECS.

The Educational Resources model had an early definition in its first phases of this project. It quickly became apparent that a multi-purpose, wideband communications system not only must interconnect academic institutions, but it must also interconnect those institutions and outside resources such as libraries, information centers, research facilities, and other centers of information and knowledge beyond the traditional academic boundaries. The "user" design concept, as indicated above, quickly reinforced this idea, as did the results of the Oregon and Midwest models. The Educational Resources model was established to identify these potential resources and to examine them for relevance to participation in the design and operational phase of ECS. The establishment of a "resources" model coincided with the rapidly developing plans of many disciplines, agencies, institutions and Federal and State governments to establish and/or expand the very type of resource that was indicated as being needed by the early results of the ECS phase. It was also significant that many of these resources had their own plans for communications networks so that collection and dissemination of information could be rapid and efficient. It was soon obvious that the ECS concept had been planted in a fertile field.

METHOD

The results of the many individual efforts in the information field have created a somewhat chaotic situation. It was necessary to identify quickly those resources that had a potential role in the operational phase of ECS and to involve them in the design at an early date. A list of specifications was established to determine these resources.

The resource:

(1) must have "something" (usually information) that has been demonstrated as being needed by potential "users".

(2) must have, or be developing, this information in a form that is easily and quickly disseminated.

(3) must be sympathetic to the concept of ECS and find it appropriate to cooperate in this sort of development.

(4) must obtain a significant reward or return in exchange for its cooperation and participation.

Many potential resources came easily to mind, but a rigid application of these four specifications soon began to define those resources that could quickly and easily fill an important function in the early operational stages of ECS. For example, the Library of Congress would seem to be an excellent resource, and undoubtedly will be in the near future. However, the library staff's efforts toward automation[1] (i.e. meeting specification 2) are still largely involved with internal matters, although their plans do provide for making their information more widely and quickly available and it is inevitable that they will participate in an ECS type of network. On the other hand, an information center such as Chemical Abstracts already meets specifications 1 and 2 in almost all of its information dissemination operations and could begin immediately to participate significantly in ECS.

During Phase III, these specifications were applied to a wide variety of potential resources. Those meeting the specifications are listed below under RESULTS. This list is by no means complete, but it does provide a sample of the variety of resources that ECS would find it desirable to involve in Phase IV.

RESULTS and DISCUSSION

All of the resources in the following list initially met the first three specifications, but all had questions, stated or implied, about the ability of their participation in ECS to satisfy specification number 4. However, this was resolved by the resources themselves when they saw that ECS pointed to a way out of the dilemma in which in which they found themselves. On one hand, they had the facilities for the rapid collection and distribution of their specialized information, but in many cases it was a system that still needed both internal development and external development in conjunction with other resources working in related fields. On the other hand, these developments could not proceed very far without being "tested in the field", so to speak, by actual "users". This field testing was difficult since there was no ready system of "users" to test the system at full capacity. ECS demonstration models could be a partial answer to this dilemma, and the resources readily perceived this. The combination of the three ECS models into one working, inter-related network would be able to give these resources the desired community of "users" that they needed to test their systems. At the same time, interconnection facilities would be available for the resources' use to assist in their development with resources in related fields. For example, Chemical Abstracts, Columbus, Ohio, has as its goal the locating and indexing of all the world's literature on chemistry. Similar goals, within their disciplines, are stated by the Engineering Index and by the American Institute of Physics in New York. It is obvious that there is some overlap between these disciplines. A given document or bit of information could conceivably be part of each resource's store of information. While each of these disciplines has a well defined procedure for reaching its goal, it is apparent that each would benefit by having rapid access to the information stores of the others. Similarly, an organization such as the Thermophysical Properties Research Center at Purdue University in Lafayette, Indiana, seeking to collect data on certain properties of all matter, would have reason to call on the information stores of all three of the resources mentioned above. In addition, each of these information collection centers could benefit from their contact with the "users" at the universities by having rapid access to new information as it is generated by these "users" and by making the specialized bibliographies and document profiles developed by one set of "users" available to all. From this brief example, one can quickly realize the many possible ways that both the resources and the "users" can benefit by their participation in a multi-purpose communications network as proposed by the Educational Communications System.

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[1] King, Gilbert, et al. Automation and the Library of Congress. Washington, D.C., Library of Congress, 1963, 88 pp available from the U.S. Government Printing Office, $2.00

Each of the following organizations has been contacted and the possibility of participation in Phase IV of ECS has been discussed. Each has expressed willingness to participate pending further detailed consultation.

Educational Testing Service, Princeton, New Jersey

The Educational Testing Service (ETS) has proposed two areas of cooperation with ECS. Both areas have to do with measurement and evaluation. The first is an operational application using ECS in the testing and reporting services that ETS supplies to institutions. The second area is an information retrieval application involving the establishment of a clearinghouse on evaluation which ETS has proposed to the U.S. Office of Education as part of the Educational Research Information Center (ERIC) program.

Chemical Abstracts Service, Columbus, Ohio

This large abstracting service is in an advanced stage of development in computerized indexing, searching and manipulation. The staff is also concerned with the problem of providing greater access to the increasing chemical literature while at the same time maintaining control of this access.

Project TIP, Cambridge, Massachusetts

The Technical Information Project (TIP) is an experiment to study the interaction between those who need information and the information itself.

The model chosen for this experiment deals with the computer storage of bibliographic and citation data of about 50% of the world's physics literature since 1963 with some additional material going back to 1950.

American Institute of Physics, New York, New York

Among this organization's several projects is a plan for indexing the world's physics literature in a form that is best suited to use by individual physicists and others. This plan is related to Project TIP.

Smithsonian Institution, Washington, D.C.

This Institution, involving many disciplines and methods of presentation, is currently seeking new ways to meet an increasingly complex role as a collector, evaluator and disseminator of information.

American Museum of Natural History, New York, New York

In the field of natural history, this museum has given particular attention to the use of communications and information technology.

Engineering Index - Engineering Societies Library

The Engineering Index is an abstracting and indexing service covering engineering literature, and the Engineering Societies Library contains all of the original material that appears as abstracts in the Index.

Pace College, New York, New York

In their plans for expansion in the very near future, the Pace College staff envisions the establishment of a Business and Economics Research Center which would have as one of its functions the establishment of an information and documentation center on Business and Economics.

Thermophysical Properties Research Center, Lafayette, Indiana

Using advanced computer and microform techniques, this center provides information on a series of thermophysical properties of matter.

Rare Earth Information Center, Ames, Iowa

This center, supported by the Division of Technical Information of the U.S. Atomic Energy Commission, has been operational since December 1965. Its function is the collection, storage, evaluation and dissemination of rare earth information.

RECOMMENDATIONS

Much work remains to be accomplished before the resources of the Eastern model can be integrated into the operational phase of ECS.

Initially, those resources which should be included in the early part of the operational phase must be determined and the specific techniques of their participation developed in close harmony with the other models.

It is recommended that key representatives of the "users" and the resources be brought together as soon as possible in order to work out these specific techniques. While the ECS staff can supply the necessary overall direction and control required in the operational phase, it is only those intimately involved with the potentials of the resources who will be able to determine the most efficient and rewarding methods of participation in ECS for all concerned.

The operational phase of ECS must be kept flexible enough to allow for new resources to become part of the system. The planning of this phase must also give careful consideration to the many extensive and concurrent efforts in the information field so that any advantages of mutual cooperation will be exploited to the advantage of all parties concerned.

Administrative Design

The final configuration of the administrative design for this model is obviously dependent on knowing which resources are to be initial participants in Phase IV, where these are located, and the number of resources located in or near the major distribution centers of the technical design (see next section - Technical Design).

A tentative administrative design follows, with the assumption that there will be one resource in each distribution center that will serve as its own ECS staff, and one switching center for the complete model located either in Washington, D.C. or New York City. Initially, then, staff will be needed only at the switching center as follows:

	(Annual)
Director	$12,000
Chief Engineer	10,000
Traffic Clerk/Secretary	6,000
3 Operators @ $7,000	21,000
Travel, Supplies and Expenses	7,000
Total	$56,000

It is estimated that space requirements for the ECS switching center will be approximately 1,000 sq. ft. In all three ECS models, the present working assumption is that existing arrangements, which provide space at no cost to the project, could be continued and expanded.

The Director, in addition to having responsibility for the overall operational activities of the Educational Resources Model, will be charged with developing new resources for participation in ECS. He must work closely with these resources and the other models to assume maximum integration and service.

The remainder of the staff will be concerned with the day-to-day operation of the system. Because of the nature of the resources it is contemplated that the system will be operated 24 hours a day, seven days a week, minus any maintenance time required. This requirement may be refined as details of the system operation become known.

TECHNICAL DESIGN
FOR
EDUCATIONAL RESOURCES MODEL
EDUCATIONAL COMMUNICATIONS SYSTEM

William J. Kessler

GENERAL

This report is an engineering translation into practical hardware of the educational specifications for the Educational Resources Model developed by ECS Associate Director Harold W. Roeth.

Communications system details are similar in many respects to the system details of the Midwest and Oregon Models and will therefore not be duplicated in this report in the interest of brevity.

Figure 48 shows the basic configuration of the intercity network. It is noted that the Network Control Center is located in New York City. The selection of Philadelphia as the location of the control center would have reduced the Telpak A monthly charges slightly. However, because of the communications requirements defined in the educational specifications for the Educational Resources Model, New York City was selected as the location of the Network Control Center. Specific locations within the cities involved in the network have not been selected. However, a final choice of such locations will not affect the system cost significantly.

Broadband Telpak A service is provided only between Cambridge/Boston and New York City at this time. Also, at the present stage of this planning, only Telpak A telephone facilities are provided to State College and Pittsburgh, Pennsylvania. Interconnection of the nearest city within the Midwest Model, (Columbus, Ohio) with the Educational Resources Model could be achieved through either Pittsburgh, Pennsylvania or Washington, D. C. The cost of such an interconnection is presented in a Midwest-to-Northeast interconnection estimate given following this section. Figures 49-54 show a breakdown of the leased terminal equipment costs for the cities involved in the communications network. Figure 55 shows the additional terminal equipment required at the Network Control Center in New York City. As in the Midwest and Oregon Models, the local ECS control center may be combined with the Network Control Center to avoid unnecessary duplication of terminal equipment and switching facilities.

Figure 56 shows the estimated cost of the local lines to the local ECS switching centers.

TOTAL LEASED COMMUNICATIONS COST SUMMARY

The total communication costs for the Educational Resources Model is obtained by summing up the:

1. Total intercity network charge

2. Total terminal equipment charge for each city

3. Total terminal/switching equipment charge for the Network Control Center in New York City

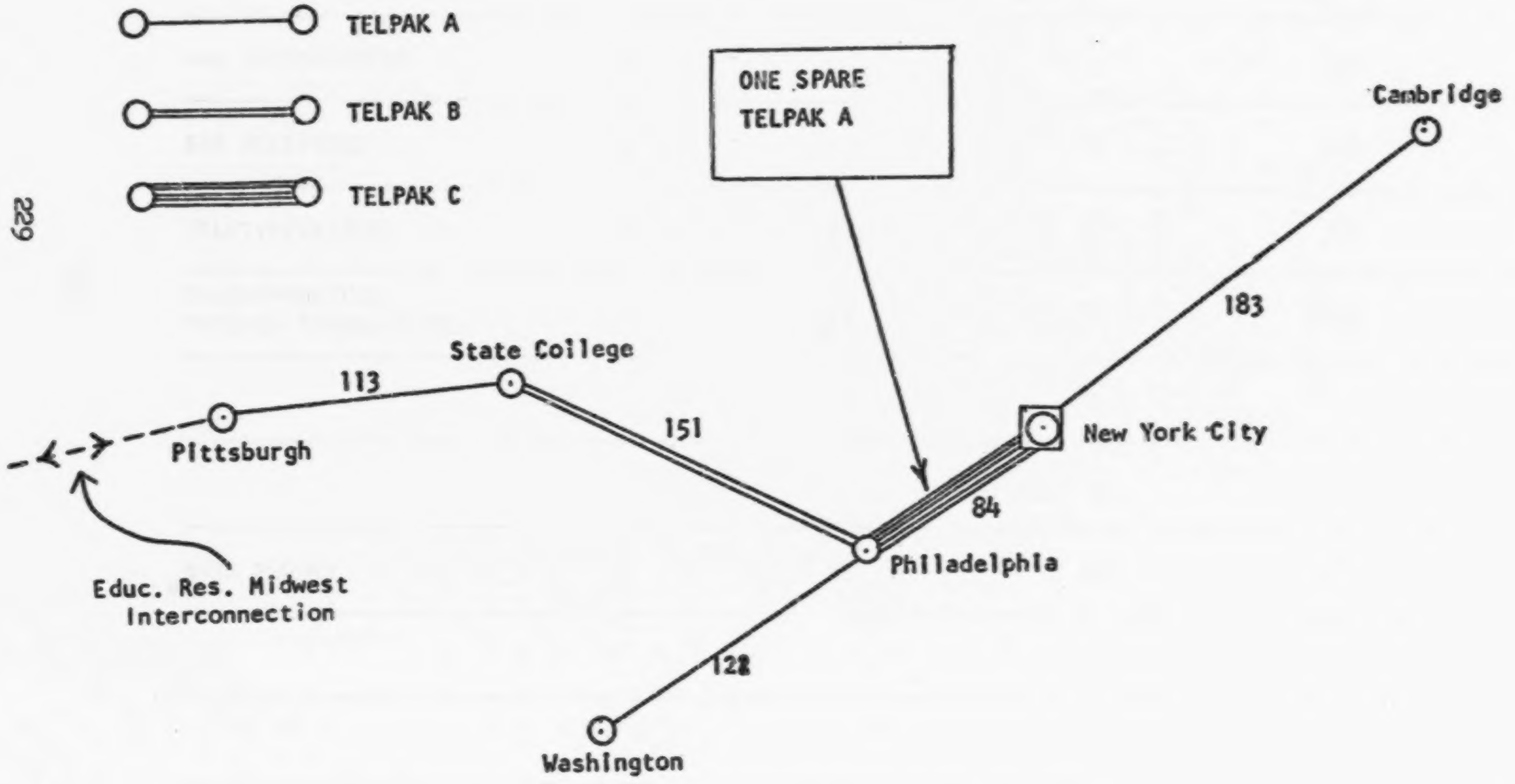
4. Total local line charges in each city

The totals for the non-recurrent charges (Summation A) and recurrent monthly charges (Summation B) are tabulated in Figure 57.

The total cost for n months becomes:

$$\Sigma A + n \Sigma B = 2{,}980 + n18{,}035$$

TELPAK A: 418 mi x $15.00/mi = $6270.00/Mo
TELPAK B: 151 mi x $20.00/mi = 3020.00/Mo
TELPAK C: 84 mi x $25.00/mi = 2100.00/Mo
$11,390.00/Mo


TELPAK A
TELPAK B
TELPAK C
ONE SPARE TELPAK A
Cambridge
183
New York City
84
Philadelphia
128
Washington
151
State College
113
Pittsburgh
Educ. Res. Midwest Interconnection

OPTIMUM INTERCITY NETWORK CONFIGURATION
Figure 48

DESCRIPTION	QUANTITY	UNIT NON-RECURRENT CHARGE	TOTAL NON-RECURRENT CHARGE	UNIT MONTHLY CHARGE	TOTAL MONTHLY CHARGE
VOICE TERMINATONS	12	-	120	15	180
BROADBAND TERMINATIONS	1	70	70	100	100
FAX TRANSMITTERS	2	-	-	115	230
EAX RECEIVERS	2	-	-	105	210
TELETYPEWRITERS	2	25	50	50	100
TELETYPEWRITER CHANNEL TERMINATIONS	2	25	50	25	100
DATA PHONES	2	25	50	40	80
TOTALS			340		920

CAMBRIDGE/BOSTON
ECS CENTER LEASED TERMINAL EQUIPMENT COSTS
FIGURE 49

DESCRIPTION	QUANTITY	UNIT NON-RECURRENT CHARGE	TOTAL NON-RECURRENT CHARGE	UNIT MONTHLY CHARGE	TOTAL MONTHLY CHARGE
VOICE TERMINATONS	12	10	120	15	180
BROADBAND TERMINATIONS	1	70	70	100	100
FAX TRANSMITTERS	4	-	-	115	460
FAX RECEIVERS	4	-	-	105	420
TELETYPEWRITERS	4	25	100	50	200
TELETYPEWRITERS CHANNEL TERMINATIONS	4	25	100	25	100
DATA PHONES	4	25	100	40	160
TOTALS			490		1620

NEW YORK CITY
ECS CENTER LEASED TERMINAL EQUIPMENT COSTS
FIGURE 50

DESCRIPTION	QUANTITY	UNIT NON-RECURRENT CHARGE	TOTAL NON-RECURRENT CHARGE	UNIT MONTHLY CHARGE	TOTAL MONTHLY CHARGE
VOICE TERMINATONS	12	10	120	15	180
FAX TRANSMITTERS	1	-	-	115	115
FAX RECEIVERS	1	-	-	105	105
TELETYPEWRITERS	1	25	25	50	50
TELETYPEWRITERS CHANNEL TERMINATIONS	1	25	25	25	25
DATA PHONES	1	25	25	40	40
TOTALS			195		515

PHILADELPHIA/PRINCETON
ECS CENTER LEASED TERMINAL EQUIPMENT COSTS
FIGURE 51

DESCRIPTION	QUANTITY	UNIT NON-RECURRENT CHARGE	TOTAL NON-RECURRENT CHARGE	UNIT MONTHLY CHARGE	TOTAL MONTHLY CHARGE
VOICE TERMINATIONS	12	10	1200	15	180
FAX TRANSMITTERS	4	-	-	115	460
FAX RECEIVERS	4	-	-	105	420
TELETYPEWRITERS	4	25	100	50	200
TELETYPEWRITERS CHANNEL TERMINATIONS	4	25	100	25	100
ELECTROWRITER	4	25	100	25	100
DATA PHONES	2	25	50	40	80
TOTALS			370		1440

WASHINGTON
ECS CENTER LEASED TERMINAL EQUIPMENT COSTS
FIGURE 52

DESCRIPTION	QUANTITY	UNIT NON-RECURRENT CHARGE	TOTAL NON-RECURRENT CHARGE	UNIT MONTHLY CHARGE	TOTAL MONTHLY CHARGE
VOICE TERMINATIONS	24.00	10.00	240.00	15.00	360.00
TOTALS			240.00		$360.00

STATE COLLEGE
ECS CENTER LEASED TERMINAL EQUIPMENT COSTS
FIGURE 53

DESCRIPTION	QUANTITY	UNIT NON-RECURRENT CHARGE	TOTAL NON-RECURRENT CHARGE	UNIT MONTHLY CHARGE	TOTAL MONTHLY CHARGE
VOICE TERMINATIONS	12	10.00	120.00	15.00	180.00
			$120.00		$180.00

PITTSBURGH
ECS CENTER LEASED TERMINAL EQUIPMENT COSTS
FIGURE 54

Description	Quantity	Unit non-recurrent charge	Total non-recurrent charge	Unit monthly charge	Total monthly charge
Pax Dial Exchange	1	575.00	575.00	500.00	500.00
Voice Terminations	60	10.00	600.00	15.00	900.00
Broadband Terminations	1	70.00	70.00	100.00	100.00
1 x 12 broadband switcher	1	10.00	10.00	25.00	25.00
2 x 2 narrow band switcher	1	10.00	10.00	25.00	25.00
TOTALS			$1,265.00		$1550.00

ECS CONTROL CENTER LEASED TERMINAL EQUIPMENT COSTS

Figure -55-

	Quantity	Unit non-recurrent charge	Total non-recurrent charge	Unit monthly charge*	Total monthly charge
Cambridge/Boston	4	5.00	20.00	15.00	60.00
New York City	4	5.00	20.00	15.00	60.00
Philadelphia/Princeton	4	5.00	20.00	15.00	60.00
Washington, D.C.	4	5.00	20.00	15.00	60.00
State College, Pa.	-	--	--	--	--
Pittsburgh, Pa.	-	--	--	--	--
TOTALS			$80.00		$240.00

*Average figures

LOCAL TERMINATIONS TO SWITCHBOARDS

Figure 56

Item				Data Source	Non-recurrent charge (A)	Recurrent Monthly charge (B)
Total Network Interconnection charge				Figure 48	---	11,390.00
Cambridge/Boston Term. Eqpt. charge				" 49	340.00	920.00
New York City	"	"	"	" 50	490.00	1,620.00
Washington, D.C.	"	"	"	" 51	195.00	515.00
Philadelphia/ Princeton	"	"	"	" 52	370.00	1,440.00
State College	"	"	"	" 53	240.00	360.00
Pittsburgh	"	"	"	" 54	120.00	180.00
BLS Control Ctr.	"	"	"	" 55	1,265.00	1,550.00
Total Local Line charges				" 56	80.00	240.00
TOTALS					3,100.00	18,215.00

Total Cost for N months $=\Sigma A + n\Sigma B = 3{,}100 + n18{,}215$

TOTAL LEASED COST SUMMARY

Figure 57

THE EDUCATIONAL RESOURCES MICROWAVE SYSTEM

The Educational Resources Microwave system is fundamentally the same type of multimedia multichannel communications system as the Midwest Microwave system. The same basic assumptions are applicable with one exception: The extensive use of microwave systems of all types along the coastal regions of the Northeast area of the United States has virtually depleted the available microwave channels in the 2, 6, and 7 kmc microwave bands. Consequently, it appears at this writing that it may well be necessary to operate in the 12 kmc microwave channel region normally used for short-haul microwave systems or to select an alternative inland route free of microwave channel congestion. The 12 kmc frequency region is very susceptable to rain attenuation and other meteorological phenomena which restrict the maximum microwave hops to fifteen miles or less if satisfactory performance is to be maintained over a wide variety of atmospheric conditions. At least one silver lining on this gray cloud is that only 100 foot towers (which are considerably cheaper than 225 foot towers) to support the repeater antennas would be required with fifteen mile repeater spacings.

The multiplexing and terminal equipment facilities available with the microwave system considered in this section is essentially a duplicate of the leased communications facilities described in the main body of this report.

One major change over the leased network described in the previous section of this report is the relocating of the network control/switching center from New York to Washington, D.C. With a microwave carrier system of the type under consideration in this section of the report, this change will not affect either the capital or operating costs and will provide a marked improvement in utilization flexibility in a Midwest-Northeast interconnection if one is provided. A microwave spur from Philadelphia to State College and Pittsburgh has not been included at this time, but can be added conveniently by extending the cost figures developed for end terminals and repeaters for the Boston-Washington backbone trunk.

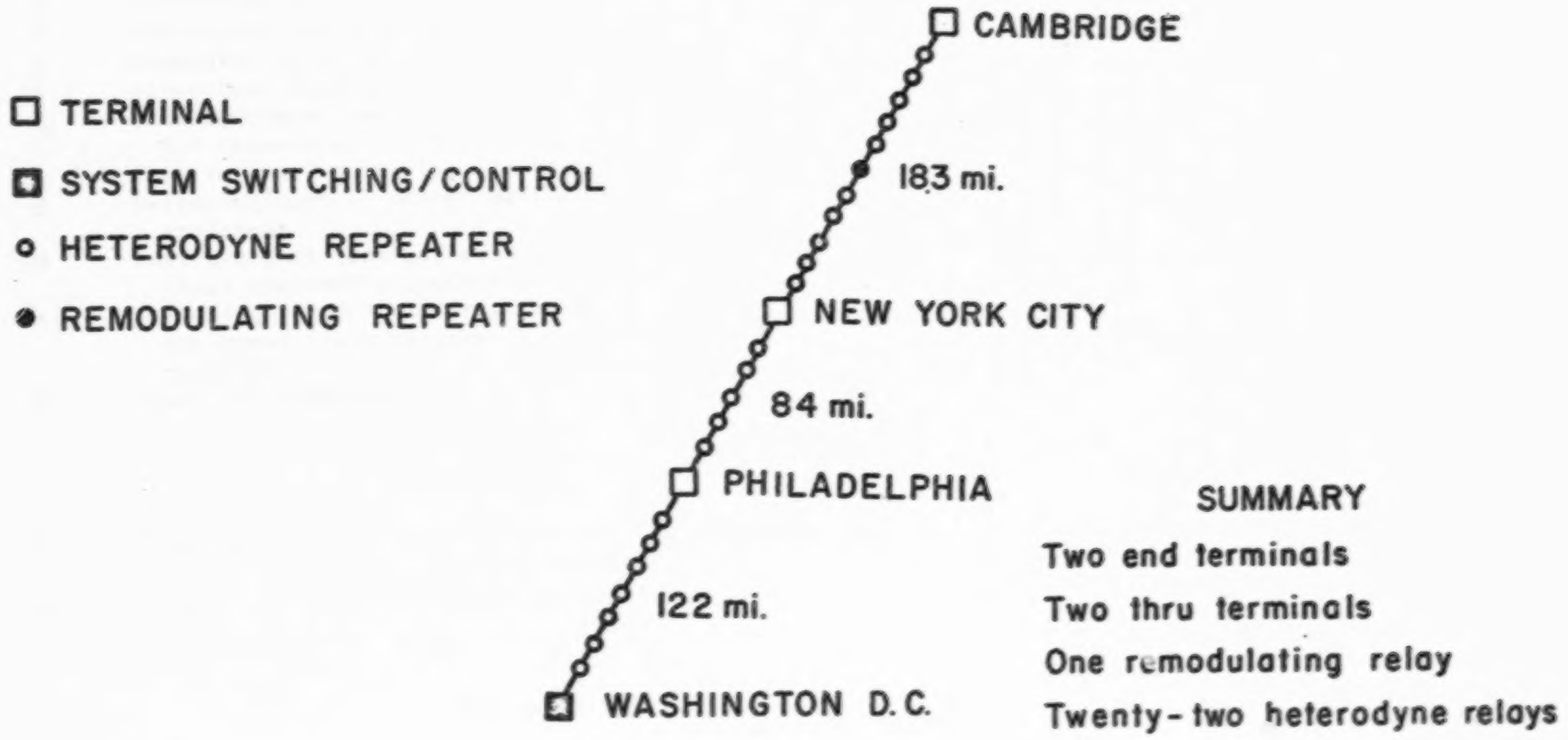
Figure 58 is a system layout of the carrier system showing the terminals, the heterodyne repeaters and the remodulating repeaters.

Figure 59 is a summary of the total capital outlay and annual operating costs of the Educational Resources Microwave System.

Thus the total cost for the Educational Resource Microwave System is:

$$\text{Total cost} = \$2,472,303 + n265,356$$

where the first term represents the capital cost of the system and the second term the annual operating costs, and n the number of years.


☐ TERMINAL
▣ SYSTEM SWITCHING/CONTROL
○ HETERODYNE REPEATER
● REMODULATING REPEATER
CAMBRIDGE
183 mi.
NEW YORK CITY
84 mi.
PHILADELPHIA
122 mi.
WASHINGTON D.C.
SUMMARY
Two end terminals
Two thru terminals
One remodulating relay
Twenty-two heterodyne relays

EDUCATIONAL RESOURCES MICROWAVE SYSTEM

FIGURE 58

ITEM	DESCRIPTION	QUANTITY	REFER TO FIGURE	TOTAL COST	ANNUAL MAINT.
1	Cambridge end terminal	1	14	31,355	1,575
2	New York City thru terminal	1	15	45,730	2,155
3	Philadelphia thru terminal	1	15	45,730	2,155
4	Washington end terminal	1	14	31,355	1,575
5	Remodulating repeater	1	15	45,730	2,155
6	Heterodyne repeater	22	16	1,424,852	66,308
7	Land purchases and access road costs for repeaters	23		66,000	132
8	Institutional multiplex equipment	3	20	95,340	4,290
9	Switching/control center multiplex equipment	1	21	141,960	6,390
10	Institutional terminal equipment (less chairman's conference console)	4	22	181,360	14,268
11	Switching/control center terminal equipment (less chairman's conference console)	1	23	40,417	2,215
12	Power for repeaters	23		----	13,800
	Subtotal			2,149,829	117,018
13	Final engineering supervision, path calculators, installation, etc., 15% of subtotal			390,566	
14	Annual interest @6% of Capital outlay				148,338
	Total			2,472,303	265,356

System cost = A + n B
= 2,472,303 +n265,356

COMPLETE EDUCATIONAL RESOURCES WIDE-BAND MICROWAVE SYSTEM COST

FIGURE 59

TECHNICAL DESIGN
FOR
INTERCONNECTION
BETWEEN THE
MIDWEST MODEL AND EDUCATIONAL RESOURCES MODEL
EDUCATIONAL COMMUNICATIONS SYSTEM

INTERCONNECTION
BETWEEN
MIDWEST MODEL AND EDUCATIONAL RESOURCES MODEL

Interconnection with Midwest Model at Columbus, Ohio, may be accomplished either through Pittsburgh, Pennsylvania or Washington, D.C. Purely fiscal considerations dictate that this inter-model connection be achieved through Pittsburgh, while the communications/traffic considerations dictate a connection through Washington, D.C.

The air line distance from Columbus, Ohio to Washington, D.C., 320 statute miles, happens to be precisely twice the air line distance from Columbus, Ohio to Pittsburgh, Pennsylvania, 160 statute miles.

It is recommended, at least initially, that the interconnecting tie-line be connected permanently to one of the Telpak Voice/narrow-band data circuits of each model. This will eliminate switching costs at the boundary of the models until utilization experience dictates additional circuit/switching requirements.

Thus a tie-line interconnection between the Midwest and Northeast (Educational Resources) models from Columbus to Pittsburgh would cost: 160 miles at $3 per mile per month = $480.00/month
From Columbus, Ohio to Washington, D.C.:
320 miles at $3 per mile per month = $960.00/month, regardless of the routing chosen for the interconnection, which should be based on traffic/utilization considerations rather than cost only.

Telpak A transmission facilities along the two airline routes from Columbus, Ohio to either Pittsburgh, Pennsylvania or Washington, D.C. would be computed at the rate of $15.00 per mile per month and would require additional terminal equipment charges.

From Columbus to Pittsburgh:
160 miles x $15 per mile = $2,400/month

From Columbus to Washington, D.C.:
320 miles x $15 per mile = $4,800/month

plus $240 initial charge, plus $350.00/month charge for the voice equipment.

Further, a Telpak A interconnection from either Pittsburgh or Washington, D.C. to Columbus, would necessitate an additional Telpak A circuit from Columbus, Ohio to Lafayette, Indiana in the Midwest Model so that the currently proposed Telpak A facility between Columbus (Two Telpak A circuits constitute Telpak B) and Lafayette would not be pre-empted by the communications traffic between models. In addition, a Telpak B facility between Columbus and Lafayette would certainly increase the size and cost of the switching facilities required at the Network Control Center for the Midwest Model in Lafayette, Indiana as well as at the Educational Resources Network tie-in point. The foregoing considerations appear to rule out a full Telpak or wide-band microwave interconnection between these two models, at least initially, until a well defined utilization pattern is established.

However, in order to include adequate reference data in this Phase III Final Report for future planning purposes, Figure 60 and Figure 61 have been included. Figure 60 summarizes the microwave carrier equipment requirements and cost estimates for a wide-band microwave interconnection between Washington, D.C. and Columbus, Ohio. Figure 61 summarizes the equipment costs for a similar interconnection between Pittsburgh, Pennsylvania and Columbus, Ohio. Although data for a wide-band microwave interconnection between Pittsburgh and Philadelphia have not been included in the Educational Resources Model Technical Design Section equipment requirements and cost figures for such an interconnection can be readily developed by extending the data given in Figures 60 and 61. The summary of interconnection costs shown in Figure 60 and Figure 61 are for a single full-duplex microwave carrier only suitable for either message/data or high-resolution television as the occasion demands. The second duplex microwave carrier, which permits the simultaneous transmission of message/data and television without sacrificing performance, can be added at minimum cost since it is unnecessary to duplicate the costs of common facilities such as property sites, power source, buildings, tower, antennas, etc.

ITEM	DESCRIPTION	CAPITAL OUTLAY (A)	ANNUAL MAINT. (B)
1	Additional Columbus Terminal Equipment	$ 9,529	$ 363
2	Additional Washington Terminal Equipment	9,529	363
3	Thirteen (13) Duplex Heterodyne Repeaters	507,000	22,815
	Microwave Equipment Subtotal	$526,058	$23,541
4	Additional Multiplex Equipment	63,560	2,860
5	Additional Switching Facilities	11,000	495
6	Repeater Land sites and Access Roads	39,000	780
7	Repeater operating costs (power)	-	650
	Subtotals	$639,618	$28,326
8	Final Engineering Supervision, path calculations, installation etc. 15% of capital outlay	95,942	
9	Interest: 6% of total cost		44,133
		$735,560	$72,459

Total Interconnection cost = $735,560 +n72,459
when n= number of operating years

SUMMARY OF COLUMBUS, OHIO - WASHINGTON, D.C. INTER-MODEL MICROWAVE SYSTEM

FIGURE 60

ITEM	DESCRIPTION	CAPITAL OUTLAY (A)	ANNUAL MAINT. (B)
1	Additional Columbus Terminal Equipment	$ 9,529	$ 363
2	Additional Pittsburgh Terminal Equipment	9,529	363
3	Five (5) Duplex Heterodyne Repeaters	195,000	9,750
	Microwave Equipment Subtotal	$214,058	$10,476
4	Additional Multiplexing Equipment	63,560	2,860
5	Additional Switching Facilities	11,000	495
6	Repeater landsites and access roads	15,000	300
7	Repeater operating costs (power)		3,000
	Subtotal	303,618	17,131
8	Final Engineering supervision, path calculations, installations: 15% of Capital Outlay	45,552	
9	Interest: 6% of total cost		20,950
		$349,170	$38,081

Total Interconnection cost = $349,170 + n38,081
where n = Number of operating years

SUMMARY OF COLUMBUS, OHIO - PITTSBURGH, PA. INTER-MODEL MICROWAVE SYSTEM

FIGURE 61

EDUCATIONAL COMMUNICATIONS SYSTEM

NATIONAL ORGANIZATION

It can be seen from the foregoing portions that the three ECS models, while they have much in common, also have significant individual traits. It is the purpose of the experimental structure of the project to encourage these local traits, which are responses to individual needs, but nevertheless to provide common bases for evaluation and a degree of cohesion among the three models.

Accordingly, the following staff structure has been deivsed.

1. Project Director. Appointed by the contractor, the National Association of Educational Broadcasters, with the concurrence of the U.S. Office of Education. Responsible for overall project supervision and coordination, relations with other projects, public information, orientation and training programs, and project development activities.

2. Associate Director for Operations. Appointed by the Director with the concurrence of NAEB. Responsible for operations involving more than one model, operational liaison among models, assistance in project evaluation, and assistance in orientation and training operations.

3. Associate Director for the Intra-State Model. Appointed by the Director with the concurrence of the Chancellor, Oregon State System of Higher Education. Responsible for operations in the Intra-State Model, supervision and training of campus ECS staff members, orientation programs for users, and integration of evaluation procedures.

4. Associate Director for the Inter-State Model. Appointed by the Director with the concurrence of the Committee on Institutional Cooperation. Responsible for operations in the Inter-State Model, supervision and training of campus ECS staff members, orientation programs for users, and integration of evaluation procedures.

5. Associate Director for the Educational Resources Model. Appointed by the Director. Responsible for operations in the Educational Resources Model, further development of this area of project activity, training and orientation programs as appropriate, and integration of evaluation procedures.

A project structure for evaluation is treated separately in a succeeding section.

Project-wide consultants would be engaged in the areas of engineering, information science, and law.

Within each model, campus staff members would be appointed by the appropriate Associate Director with the concurrence of the respective campus administration. These staff members handle scheduling of the system, operate and service the equipment, conduct local orientation programs, and maintain records for evaluation purposes.

At every level, the unique contribution of administrative personnel should be underscored. In this administrative staff, the universities will have a group that devotes full-time attention to identifying and solving communications problems of many kinds. Particularly at the local campus level, there will be a need for personnel to see that the system simply works well; but in the long run, the critical job will be to understand and deal effectively with a very wide range of communications requirements involving many academic disciplines and technical specialties

As the system grows beyond its experimental stage, fewer staff members will be required. At the present time, ECS is dealing with techniques and equipment which are largely unknown to potential users: a professor conceptually may realize the value of a graphic transmission device, for example, but he can hardly be expected to make very good use of one until he learns what it will do and how to make it do that. Left to his own devices, he will probably conceptualize the need for a device and then fail to use it at all. As the system matures, and as its users become acquainted with a new set of tools, it will be possible to turn increasingly to automatic switching equipment and user-operated terminal equipment. Staff members will spend relatively more time in developmental work, and relatively less in the mechanics of orientation and operation.

Following is the annual budget for national operations. Note that certain costs, such as employee benefits, are included for the entire project in the summary budget which appears at the end of the discussion section. Evaluation is treated in a succeeding section.

Project Director	$17,500
Associate Director for Operations	14,000
Engineering Consultation	10,000
Other consultants	7,500

Office supplies and expenses	$ 4,500
Staff and Consultants' Travel	12,000
Advisory Panel Expenses	6,500
Office rental	3,600
TOTAL	$75,600

NEGOTIATIONS WITH TELEPHONE COMPANIES

In considering the use of telephone company facilities for the execution of ECS technical designs, a number of tariff and policy problems arise. To work toward resolution of these problems, meetings have been held with representatives of the American Telephone and Telegraph Company, Indiana Bell, Northwestern Bell, and General Telephone and Electronics. It appears that the matters discussed below are not unique to ECS, that solutions are possible, that telephone company policy seems to be moving toward some accommodation with ideas like those of ECS, but that final solutions will take time.

The principal points at issue are:

1. The common carrier concept of the authorized user. With a few exceptions, common carriers deal only with the consumer of the service, and not with intermediaries.
2. Restrictions on the use of the service. Central to the common carrier concept is that the carrier does not lease facilities; he provides a specific service. ECS, in effect, asks carriers to provide bandwidth in bulk, to be used in a number of alternate modes which are under the customer's control.
3. In addition to the general restriction above: specific restrictions, such as the prohibition against transmission of program material over Telpak circuits.
4. The technical characteristics of Telpak. Generally speaking, Telpak is a billing arrangement which allows customers to take advantage of wholesale rates for heavy use of ordinary telephone service. Secondarily, some Telpak customers use the service for broad- or narrow-band data transmission. The specific nature of the service - its precise technical dimensions - can vary considerably within the tariff rate structure, depending on the customer's requirements.

It appears that telephone company policy may be undergoing changes which will include ECS-type organizations as authorized users, and that as the technical sophistication of both the customer and his requirements increases, tariffs will permit more customer control of communication facilities.

The prohibition on the use of Telpak for program material is an obvious inconsistency, because telephone companies encourage the use of ordinary voice facilities for telelecture presentations which, in content, are programs. The use of a higher quality circuit within Telpak for essentially the same material is presently forbidden, whether or not the material is broadcast.

In considering the Telpak-based technical configuration of ECS, the telephone companies have suggested alternate ways to provide the same communication services. Essentially, this system, proposed for the Midwest model, would involve a central manual switchboard for narrow-band services (ordinary voice-grade telephone service and data services which have similarly modest transmission requirements). Broadband services, such as FM-quality audio, high-speed facsimile, and data transmission at moderately high bit rates, would be handled directly by the telephone company on an individual order basis.

This arrangement would permit operation within existing tariffs and policies, with existing off-the-shelf telephone company hardware, within two to three months from order date.

From the perspective of the ECS staff, this arrangement would permit an operational start, but would not provide sufficient flexibility of development and would not provide an adequate test of the engineering ideas developed in the project. Telephone company representatives have stated, however, that as trial operation begins within the framework of existing tariffs, policies, and equipment, work will proceed within the company in consideration of changes which are required by ECS designs

One further Telpak consideration is necessary here. This is the federal government Telpak service maintained by the General Services Administration. GSA is the sole contractor with the telephone companies for Telpak service, and the agency resells individual channels within these Telpaks to those federal agencies that require them.

Recent decisions make it possible for state governments to participate in the GSA Telpak arrangements. Still more recently, it has been determined that state universities, as units of state government, are generally eligible. Nine of the eleven universities within the Midwest ECS model are state universities. The other two, Northwestern and the University of Chicago, are private institutions, but it may be possible to serve them via the Chicago Circle Campus of the University of Illinois, using regular Telpak arrangements between Chicago Circle and the two nearby private universities.

This could effect a very substantial saving in intercity transmission costs. For example, a single telephone-grade channel, billed at Telpak A rates as of August, 1966 costs about $1.25 per mile per month. A similar channel, billed at Telpak D rates (the maximum bulk-use discount) costs something less than $.20 per mile per month. Thus, if the ECS Midwest service were to qualify for GSA service, and if appropriate interface can be arranged between Chicago Circle, Northwestern, and the University of Chicago, ECS intercity charges could be reduced as much as 60 percent.

The State of Oregon, of course, provides an even neater administrative arrangement for GSA, since ECS essentially would be part of the state communication system.

As Phase III of the Educational Communications System study concludes, it appears that the Telpak tariff will undergo drastic revision. An appellate court decision in mid-September 1966 upheld the contention of the Federal Communications Commission that there is no competitive reason for the existence of Telpak A and B, and that the rates on Telpak C and D are so low as not to be compensatory. At this writing, the response of the telephone companies has not been made, but it seems clear that the net result will be higher prices to Telpak users.

EDUCATIONAL COMMUNICATIONS SYSTEM EVALUATION

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Warren F. Seibert
John Shepherd

EVALUATION

Need for Evaluation. The purpose of this section is to emphasize the need for developing evaluation plans which can be put into effect when ECS enters Phase IV - the operational phase - of the model systems. It is assumed that the purpose of this evaluation would be two-fold.

(1) To determine the worth of the systems in order to justify continuation and expansion if these seem warranted, and

(2) To determine ways in which the systems and the services they provide can be improved.

In this section an attempt will also be made to outline evaluation procedures and to indicate the kinds of records that should be maintained in order that the necessary data will be available for subsequent analysis.

Objectives of ECS. An evaluation must be planned and conducted with reference to the goals which the project seeks to achieve. In this connection it is assumed that the purposes of Phase IV of the three model systems will be as follows:

(1) To encourage faculty members and administrators to make increasing and varied use, for purposes of educational communication, of the technology which exists or which becomes available.

(2) To explore new uses of this technology in order to facilitate educational communication between educational institutions and other sources of information with which they may be connected.

(3) To study the acceptability of these communication systems to their users, and the barriers which inhibit their use by others.

(4) To investigate the feasibility of these communication systems in terms of technical adequacy, reliability of operation, costs of operation in relation to use, kinds of staff and organization needed to serve the faculty and administrations, and kinds of staff and organization required for operation and maintenance of the systems.

Methods of Evaluation. It is proposed that the methods of evaluation during Phase IV will involve the collection and analysis of descriptive data rather than experimental research studies conducted under controlled conditions. Later, after the systems become more fully developed, it may be feasible to conduct some experimental comparisons under controlled conditions.

Furthermore, it is suggested that some kinds of information and attitudinal responses should be collected from potential users before the operational phase begins and periodically (say, at the end of each year) during the operational phase. In this way it should be possible to obtain indications of trends in usage and acceptance to various categories of users and non-users.

Some specific suggestions. The development of system cost and use records, questionnaires, and the like will require the efforts of a research group that will work with the project during the operational phase.

However, at this time it might be helpful to spell out some of the kinds of information that will be needed for later analysis and systems evaluation.

Uses of system. (a) For what purpose were the various elements of the system used?
(b) How frequently were they used?
(c) Who used them?

To gather such data it will be necessary to keep logs at appropriate locations. Depending on the configuration and design of the system, this may be done by a traffic manager at central control, by users, by those who have been called on for services or by some combination of these. This could be done on either a continuous or a time-sampling basis, and the information could be stored in a computer.

Satisfaction with uses. Users of the system should be queried periodically with respect to the following kinds of items:

(a) What did the system enable the user to do that he did not do before?

(b) How satisfactory was the performance of the system from the user's point of view?

(c) How accessible was the system?

(d) What is the perceived value of the various services or functions performed by the system as seen by those making extensive use and those making minimal use of the system?

It will probably be necessary to develop different questionnaires or other instruments for different categories of users: e.g. administrators, teachers, research personnel, students, etc.

Feasibility Studies. It will be desirable to conduct feasibility studies covering a number of dimensions of the ECS operation:

(a) Cost-efficiency: Detailed records of costs should be kept and these should be considered in relation to volume of the various uses that are developed for the system.

(b) Operational Reliability of the Systems: Detailed logs that record breakdowns and maintenance of the system should be kept in order to get information about operational reliability of various elements which might lead to system improvement.

(c) Staffing operations: Information should be sought periodically concerning the roles of the various staff members, the types of people needed to perform the various functions and the recruitment and training of such personnel. These studies should include personnel responsible for supervision, contact with faculty and administration, routine operations, maintenance, etc.

(d) Management: Information should be sought periodically concerning management aspects of the system including budgeting, time sharing, scheduling, and adequacy of capacity of channels in terms of use demands, priorities, needs for expansion, etc.

(e) Demands for Data: Information should also be obtained from those who respond to demands for data or similar services, to see whether they are able to cope with demands, and whether the system or its managements need revision. Such people would include those responsible for computer services, library services and similar data banks.

Overall Analysis: In the overall analysis of data it would be useful to compare patterns of use of the systems on various campuses. These patterns would include the kinds of uses, volume of use, and types of users. This analysis should be considered in the light of certain demographic information from the various institutions. The analysis would be facilitated if much of the above data could be collected in a form that could be handled on a computer.

Recommendation.

As ECS enters its operational phase, it is recommended that an evaluation group be formed to consult with the personnel responsible for the operation of each model. This evaluation team should include at least two people who are competent in social science research in relation to the use of media, plus a cost accountant, an operations analyst, and an engineer. It would be highly desirable to collect similar and comparable data on each system that goes into an operational phase.

This team would consult with the staff of each model and the coordination of this team would be the responsibility of a full time evaluation specialist on the ECS staff.

Budget	Per Year
Project Officer Research	$14,000
5 Consultants @ 10 days a year at $100 day	5,000
Travel	3,000
Secretarial and office supplies	4,000
	$ 26,000
3 years	78,000

Other Research Opportunities. The establishment of the above evaluation procedures and methods of gathering data may facilitate other kinds of inter-institutional research into such questions as the factors in an institution which encourage or inhibit the use of new educational technologies, general improvement in the methods of recording data concerning students in different institutions, and development of new methods of cost accounting and budgeting with reference to educational methods and equipment.

CONCLUSIONS, IMPLICATIONS, and RECOMMENDATIONS

Conclusions

Phase III of the Educational Communications System study provides technical designs, administrative structure, financial information, and evaluation guidelines for three model versions of an Educational Communications System. The technical designs are provided in two versions: one based essentially on the telephone companies' Telpak tariff and one based on a broadband microwave system.

This design phase was undertaken following preliminary surveys which indicated that university faculties and administrations in all parts of the continental United States believed a multi-purpose communication system to be essential and inevitable in the future of higher education.

This report describes in detail three systems which share numerous service functions, but which are intended for three quite different settings: within a single state (Oregon), within a region (the Midwest), and a model involving "resources" rather than universities per se (the Educational Resources Model, based in New York). Through careful grassroots work with administrators and faculty members in the participating institutions, it was determined that the system's basic requirements are increased communication (in various modes) with professional counterparts on other campuses; easier administrative communication, both to ease coordination within university systems and to facilitate cooperative efforts among autonomous universities; maximum use of expensive computation and communications equipment; an interconnected broadcasting network; and, very importantly, wider cooperative use of library resources and information centers.

The level of cooperation and participation in ECS planning activities leaves little question that such a system is considered valuable by higher education. Full cooperation has been extended by all eleven members of the Committee on Institutional Cooperation(in spite of the fact that actions of the Committee are not binding on the member universities), by all institutions within the Oregon State System of Higher Education and with the warm support of the Chancellor of the System, and by numerous potential "educational resources" on the northeastern seaboard.

Implications

Many aspects of the ECS project already are affecting other educational communications activities. States which established educational television networks, for example, appear to be broadening their operations to follow out the logic of a complete multi-purpose system. There seems to be a growing realization that the communication requirements of education are becoming much more diverse, and that meanwhile, technology is closing the gaps between communication media. Universities now wish to communicate not only by telephone, but through high-speed computer transmission, graphic displays of library information, televised course segments, rapid transmission of printed research data, etc. Some universities are beginning to reflect this concern in their administrative structures, placing all communications operations under a single staff authority.

Implications of this idea go farther than universities, of course. Such developments as the regional educational laboratories, the Educational Research Information Center, various academic consortia, and similar activities all have communication requirements beyond the presently conventional.

One of the important business results of projects like ECS is the change likely to be wrought in common carriers' policies. As communication requirements change, so must the practices of the companies that provide communication services. The growing number of privately owned communication systems is probably a sign that a cultural lag exists between the requirements of customers and the structure of the companies. Tariffs are not, after all, immutable; they are to a considerable extent statements of common carriers' policies, accepted by the Federal Communications Commission as serving the public interest. Even within that framework, tariffs are implemented through company interpretations which can evolve as circumstances require. Working relations between ECS staff and telephone company representatives have been uniformly friendly and frank, and none of the above is intended to disparage the work of the companies which have provided the United States with the best communication system in the world. It is suggested, however, that change is in the air, the logic of the ECS position appears to be sound, others are arriving at much the same position, and it is time for the carriers to recognize that tradition is not sufficient reason to retain a given practice, and that customers do indeed have valid interests in the technical characteristics of carriers' services.

Recommendations

The National Association of Educational Broadcasters and its partners in the Educational Communications System endeavor will shortly present proposals for the implementation of Phase IV. The present report provides the basis for a very flexible operational phase: while the tasks to be performed are quite similar, a range of technical alternatives is specified. It is anticipated that maximum use will be made of this range of alternatives, so that several kinds of experimental operation can be evaluated within the context of one unified project.

This selection of alternatives probably makes the report of maximum use also to institutions outside the model areas, since the main ideas of ECS can be applied to a wide variety of local needs.

The principal recommendation of the project director, once implementation of these designs is assured, is that the concepts of ECS be tested and adapted for use in elementary and secondary education. The use of electronic data processing in local school districts, the full development of computer-based instructional systems, the full use of instructional broadcasting techniques and, in summary, the development of educational technology on an appropriate scale in public schools now depends upon proper development of communication systems.

As a final recommendation: much attention should be paid to problems of technical and operating standards. A great many state networks are developing; ECS adds another dimension; other educational requirements will soon become clear; and the logic of the situation requires economical, convenient communication among all the parties and in all of the appropriate modes. This will only be possible if the various elements are brought together into a real community of interest and, without attempting to make rules for the sake of the rule books, adopt reasonable standards in fields from transmission to indexing before we mutually develop a Babel.

SUMMARY

This is the final report of Phase III of a four-phase need and feasibility study which was established to examine the establishment of multi-purpose communication systems for American higher education. Phases I and II determined that substantial interest in such a system exists within colleges and universities in all parts of the continental United States. The current phase has as its task the design of three model systems, which are summarized below. The fourth phase is an operational test of these designs.

The three Educational Communications Systems models are:

a. Intrastate, involving all public institutions of higher education in the State of Oregon, developed in cooperation with the Oregon State System of Higher Education.

b. Interstate, involving the Big Ten universities and the University of Chicago, developed in cooperation with the Committee on Institutional Cooperation; and

c. Educational Resources, concerned not with specific sets of universities but developed on the premise that universities should also be interconnected with such institutions as research centers, major non-academic libraries and information centers, etc.

Surveys of faculty members and administrators established that presently perceived areas of need are increased communication in various modes with professional counterparts on other campuses; easier administrative communication, both to ease coordination within university systems and to facilitate cooperative efforts among autonomous universities; maximum use of expensive computation and communications equipment; an interconnected broadcasting network; and, very importantly, wider cooperative use of library resources and information centers.

For the accomplishment of these purposes, Phase III of the Educational Communications System project has resulted in technical designs which present two alternative transmission systems: one based on the telephone companies' Telpak tariff, providing a relatively narrow-band service; and one based on multi-purpose broadband microwave transmission. Administratively, the plan calls for a small national staff to coordinate and direct evaluation of the total project, with the National Association of Educational Broadcasters as the contracting agency; for field staffs to be located in each model; and for personnel to be available to each participating campus in order to operate the system. Both in terms of equipment and personnel, the systems are designed for easy evaluation and for maximum flexibility in the early evolutionary stages, with a minimum of preset automatic equipment to inhibit natural growth.

The study appears to have implications for the development of state and regional networks which heretofore have been single-purpose in nature, generally having been established for educational television transmission. There are implications also for communications common carriers, since some of the concepts explored here are at variance with traditional common carrier practices.

Recommendations, in addition to implementation of the designs on a trial basis, are for the adaption of these system concepts for elementary-secondary use and in such developments as the regional laboratories, and for serious attention to be paid to problems of technical and operating standards.

REFERENCES

Research Reports

1. Miles, James S. CIC Instructional Television Survey. Unpublished report of the Instructional Television Committee, Committee on Institutional Cooperation, Purdue University, September 1965. 322p.

2. Special Committee on Educational Television. A Study of Educational Television in Oregon. Unpublished report, Oregon State System of Higher Education. January 1965. 152p.

3. Starlin, Glenn, and Lallas, John E. Inter-Institutional Teaching by Television in the Oregon State System of Higher Education. Final report of a project sponsored by The Oregon State System of Higher Education with contributions from The Ford Foundation and the Fund for the Advancement of Education. Eugene, Oregon. August 1964. 45p.

APPENDIXES

APPENDIX A

Member Institutions
Committee on Institutional Cooperation

Institution	CIC Representative	CIC/ECS Prime Contact
Chicago	Warren C. Johnson	John B. Buckstaff
Illinois	Lyle H. Lanier	Charles J. McIntire
Indiana	Ray L. Heffner	Donley F. Feddersen
Iowa	Willard L. Boyd, Jr.	Robert F. Ray
Michigan	Robert L. Williams	Garnet Garrison
Michigan State	Howard R. Neville	Armand L. Hunter
Minnesota	Stanley J. Wenberg	Burton Paulu
Northwestern	J. Lyndon Shanley	Charles F. Hunter
Ohio State	John C. Weaver	Richard B. Hull
Purdue	Paul F. Chenea	James S. Miles
Wisconsin	Robert L. Clodius	H. B. McCarty

APPENDIX B

ECS Planning Committee
Info Sheet - A
October 22, 1965

EDUCATIONAL COMMUNICATIONS SYSTEM (ECS)

Midwest Model Feasibility Study

PURPOSE

Separate ventures of interinstitutional cooperation and information exchange through the newer communication devices appear daily. Perceiving a growing need for interconnection between universities and other major resources, communications consultants, educational broadcasters and university administrators have explored ways to determine the extent to which a communications system would be useful.

Modern technology offers many alternative methods of communication, and it is felt that these newer devices, if lashed together in a manageable, easily accessible system, can materially help higher education meet many of its growing problems.

With the National Association of Educational Broadcasters as the contractor, the U.S. Office of Education has funded a three phase study to determine the educational and administrative needs, technical specifications, operational organization and economic implications of an Educational Communications System. Concurrent studies are being carried on to determine the feasibility of educational communications systems. These are: an intra-state model, an interstate, regional model and an eastern seaboard model which would tap non-university resources.

The feasibility of a regional educational communications system will be tested among the Big Ten Universities and the University of Chicago through agreement with the Committee on Interinstitutional Cooperation (CIC). The participation of the CIC in the study is in line with its traditional role of seeking mutually beneficial ways in which its member institutions can cooperate.

The current ECS feasibility study will attempt in 1965-'66 to test the assumptions that (1) additional communication on all levels is necessary and desirable between the universities, (2) economies and operational flexibility will accrue through joint use of a system and (3) the resulting ease and flexibility of communication will increase understanding between faculties and increase efficiencies and enhance professional growth on the individual campuses.

APPENDIX C-1

ECS Planning Committee
Info Sheet - B
October 22, 1965

EDUCATIONAL COMMUNICATIONS SYSTEM

Midwest Feasibility Study

A Partial Inventory of Communications Hardware

1. Slow Scan Television
   Relatively inexpensive TV transmission and receiving equipment provides for the exchange of "still pictures" via phone lines. Used widely in industry, (e.g. - by banks for verification of signatures) this simple television system might be compared to a long distance, black and white filmstrip. It will transmit in a series of separate pictures anything the TV camera can pick-up. Hard copies may be obtained at the receiving end.

2. Electro-writing
   Called variously "Remote Electronic Blackboard", "V.E.R.B.", "telewriting" etc., this device permits the "transmitter" or writer to make handwritten notations, drawings, etc. which are simultaneously and mechanically reproduced (and may be projected) at the receiving locations. When combined with telephonic communication, visual, as well as audio information can be transmitted.

3. Teletype
   A network of typewriters linked together by phone lines makes possible the rapid exchange of typewritten messages between departments, division or offices at different institutions.

   Present technology also permits teletypewriters to query and receive information from a central computer location.

4. Telelecture
   Permits guest speaker or lecturer to address groups at scattered locations by telephone from his own lecture

station, home or office. His voice is amplified through a simple speaker system at the receiving location. Two-way communication to handle questions, reactions and comments is easily achieved.

5. Data-phone
   A flexible service which permits normal conversation between individuals over a pair of phone lines at one moment--and through a simple switch can at the next moment connect business machines or computers to permit data flow over the same lines.

6. Facsimile
   This is a process of transmitting by phone line hard copies of printed or flat graphic material from one point to another. For example, Library 'A' might provide Library 'B' copies of pages from a reference book.

7. CAI (Computer Assisted Instruction)
   This is a relatively new, sophisticated means of programmed instruction, the components of which consist of the student station and a specially programmed highspeed data processor. The CAI program prepared by the instructor, causes the computer to present material to the student and to accept his typewritten responses. The material presented to the student can be displayed on a screen or typewriter or both. The student responds to the material by operating a typewriter-like printer keyboard which is keyed directly to the computer.

8. Videofile
   A single-frame or document storage and retrieval system utilizing television tape technology. A single 4800' x 2" video tape will store over 100 thousand separate magnetically recorded images or pages. Any selected image may be instantly retrieved as a printed (electrostatic) copy or as a displayed image on a television monitor. Images can be selectively erased and replaced and the entire file can be duplicated in a matter of a few minutes.

APPENDIX D-1

ECS Planning Committee
Info Sheet - C
October 22, 1965

EDUCATIONAL COMMUNICATIONS SYSTEM (ECS)

Midwest Model Feasibility Study

A Partial Inventory of ECS Uses

The Educational Communications System is envisioned as a broad, multichannel electronic path interconnecting universities with each other and with other major information resources. Such a system could facilitate communications and provide a variety of communications tools and services for information exchange. The ECS could permit these cooperative activities to be regularly scheduled for its users by local campus systems coordinators. Outlined below are general descriptions of some uses to which such a system could be applied. Examples are hypothetical and are described in broad terms. However, in all cases technology now exists to accomplish the communications goals as described.

I. COMMUNICATIONS BETWEEN AND AMONG COUNTERPARTS

A. Audio conference supported by slow-scan TV and electrowriter.

(1) Professors at several institutions teaching similar courses, discuss mutual problems of course development by phone from their respective offices. Each may display from their desks examples of pertinent visual material (photos, tables, drawing, diagrams, etc). Individual professors may then obtain hard copies of selected visual material. Each may also supplement his remarks by making notations or sketches with an electronic stylus. The hand written images thus made appear simultaneously at all connected offices.

(2) Using the same aids, research associates at different institutions confer and compare visual results of research in the form of photos, tables, etc. supporting their remarks with sketches and notations.

B. Audio conference supported by the electro-writer

(1) Mathematicians on several campuses confer by phone and supplement their discussion with notations which are displayed at each conferee's desk.

(2) Principle investigators of related research projects at several institutions exchange information by phone and through visual displays of notes, formulae, sketches, etc. to which any or all can contribute.

C. Audio conference supported by slow-scan TV

(1) Librarians confer to display requested specialized published material which can be converted to hard copy at any station.

(2) Registrars meet in audio conference to display student records or transcripts.

D. Audio conference

(1) Department heads of the same department on all campuses meet regularly to exchange administrative information.

(2) Research assistants on several campuses working on similar projects meet by phone to discuss progress and problems encountered.

II. COMMUNICATION BETWEEN GUEST AUTHORITY AND FACULTY OR STUDENT GROUPS AT DISTANT CAMPUS

A. Guest lecturer supported by slow-scan TV and/or electro-writer

(1) Nationally known expert speaks to campus group from his office in distant city by way of amplified telephone signal. He illustrates his lecture by displaying visual material via slow-scan TV and by using an electro-writing stylus makes notations which are projected for his distant audience.

(2) Government official at his desk in Washington speaks to faculty meeting and reinforces his remarks by using the electro-writer. Two-way communications allows member of the audience to ask questions of the speaker.

B. Guest lecturer

(1) Specialist on particular subject speaks from his desk to class at distant campus and entertains questions from his audience.

(2) Nobel Prize scientist in New York speaks to and answers questions from an audience of graduate students assembled at several institutions.

III. COMMUNICATION BETWEEN FACULTY OR STUDENTS AND INFORMATION STORAGE AND RETRIEVAL CENTER

A. Computers

(1) Research directors at several institutions have direct access to distant computer.

(2) Students at several institutions engaged in computer assisted instruction share centralized computer.

(3) Librarians at various institutions have direct tie-ins to Library of Congress computer for same day retrieval of bibliographical or cataloging information.

Electronic interconnection between institutions and central storage and retrieval systems can provide a great variety of immediate access or same day services. Present technology makes it possible for information to be captured on demand and in a variety of languages. Some examples: teletype hardcopy, computer tape-tape, slow-scan television, facsimile, photo-copy, punched card or punched tape.

APPENDIX E-1

ECS Planning Committee
Info Sheet - D
October 28, 1965

EDUCATIONAL COMMUNICATIONS SYSTEM (ECS)

Midwest Model Feasibility Study

Cases in Brief: Some Communication Developments in Education

The University of California at Davis and the University of Nevada are installing a facsimile link for the inexpensive transmission of printed and graphic materials between libraries. A somewhat more flexible interconnection exists between northern and southern campuses of U. C.

For some years, Stephens College has been the center of a group of Missouri Colleges linked by an amplified telephone (telelecture) system. Outstanding world figures in many fields regularly lecture to these colleges by this means. The colleges also benefit from the cross-fertilization of ideas when classes in separate colleges participate in a common program.

Through its MEDLARS (Medical Literature Analysis and Retrieval System) program, the National Library of Medicine has recorded on computer tape bibliographic references to all periodical literature in medicine for the past several years. The MEDLARS computer assembles, arranges, and sets in offset type the complete monthly Index Medicus, and in addition conducts demand searches for researches in biomedicine. A number of regional MEDLARS centers are being established. The MEDLARS staff and the National ECS staff are maintaining liaison on developments of mutual interest.

In order to facilitate cooperative library services, a number of teletype networks have been established. A small but complete network serves the libraries associated with the large Enoch Pratt Free Library in Baltimore. A larger, more diffuse program involves libraries in the Rocky Mountain-Great Plains area served by the regional bibliographic center at the Denver Public Library.

A line between the University of Illinois campuses at Urbana and Chicago allows "level" use of data processing equipment at both locations. Jobs are shunted to the equipment with the lightest load.

The medical libraries of Yale, Harvard, and Columbia are working toward a cooperative, computer-based cataloguing system that would eventually provide a scholar with quick access to material in any of the three large libraries.

The Maryland Department of Education and the Brooks Foundation are working together to develop, in Columbia City, Maryland, a unique service based on the town's television cable system. Instead of limiting the system to distribution of broadcast television, a computer and local TV adaptations would be tied in. One of the implications of the system will be computer-assisted instruction, with televised visual aids, in every home.

A project at the University of Denver focuses on the recording, on computer tape, of the body of natural resources law, with its administrative decision, judicial precedents, etc. Through a special indexing system, the computer could be queried by students, legal scholars, and practicing attorneys. Chancellor Chester M. Alter foresees the development of similar services in other legal areas, eventually to be interconnected into a vast information resource for the legal profession.

APPENDIX F-1

ECS Planning Committee
Info Sheet E
November 1965

EDUCATIONAL COMMUNICATIONS SYSTEM (ECS)

Midwest Model Feasibility Study

A SURVEY OF NEEDS

Communication and its role in academic life is so critical that it may be regarded as central to all activity and success. Whether in teaching, research, administration, or service, the effective transmission of information is crucial and, still too often, absent. In recognition of the needs, many communication procedures have developed and they now include conferences, professional meetings, published articles, lectures, memoranda, bulletins, committee meetings, formal correspondence, plus variations on these and other themes. Nevertheless, even with this variety, many difficulties remain. In varying degrees, the alternative forms of communication are often very inconvenient, costly, imprecise, slow, time consuming, or burdened with irrelevant ritual.

Efforts are now being made to supplement and improve educational communications and one such effort is a project devoted to planning a new Educational Communications System. Initially at least, the project aims to establish a system which will interconnect the universities of the Big Ten, plus the University of Chicago. Plans are also being made for an interconnection with cultural, educational, industrial and governmental resources on the eastern seaboard. The responsibilities of the current project are to specify (1) the academic and administrative uses of the System and (2) the technical, financial, and management characteristics of the System.

Before the more specific questions can be answered, an outline of interests and needs must be prepared. To accomplish this, a number of university faculty and administrative officers are being asked to write freely concerning the types of inter-university communication they envision which, for them, would serve usefully. We invite you to give thought to the kinds of communications which, if available, would assist you in your teaching, research, administration, or other duties. Please do not feel that your ideas should be conventional, clearly practical, or thoroughly detailed. Instead, let the needs which you feel be the major determiners of your suggestions.

Some details of the system can now be assumed as follows: -

1. It will operate 24 hours per day, 365 days per year.
2. It will be used for communications between any two or more of the eleven universities (and eastern seaboard resources.)
3. Transmitted messages may be any of any duration to a maximum of perhaps two hours.
4. The transmitted messages may be human voice, still pictures, numerical data, teletypewriter messages, or remotely controlled stylus (but not television). Transmitted messages may be recorded for later use.
5. The messages may involve one "transmitter" (e.g., speaker) and one "receiver" (e.g., listener), one to a few, one to many, a few to one, a few to a few ... or many to many. Communication may be in one direction only or in both directions.
6. The communications may be those which occur at regular intervals or irregularly, frequently or infrequently.

Some instructive examples of System used are the following: 1) transmission of research data from University A to University B; 2) a monthly symposium devoted to topics in sociological research; 3) a quarterly "meeting" of English departmental chairmen; 4) a reference question directed from University A to the library of University B; 5) a bimonthly "convention" for graduate students in Chemistry, at which research papers are delivered; and 6) noted professor at an eastern university lecture mostly to graduate students at University C.

Very possibly, none of these examples fulfill needs which interest you. Nevertheless, we trust that you can generate examples and identify needs which for you would be important. Please use the Idea Report Form to describe your ideas.

APPENDIX G-1

Name____________________________
Title____________________________
Mailing Address____________________
____
University________________________
Date____________________________

ECS Planning Committee
Info Sheet F
November 1965

EDUCATIONAL COMMUNICATIONS SYSTEM (ECS)

Midwest Model Feasibility Study

Idea Report Form

In the space below and on additional pages, please describe one or several ways in which your colleagues or you could use and be served by an inter-campus communications system. In each description, please try to be liberal, "creative", and generally unrestrained. In other words, please recognize that the availability and use of a versatile intercommunication system is, in itself, a novel, almost incredible idea in education. It is possible, then, that some of the most valuable uses of the system will seem, at least initially, to be novel and even incredible.

Bear in mind that the communication system is assumed to interconnect all Big Ten universities, plus the University of Chicago, and selected resource institutions on the eastern seaboard. Information transmitted between sites may be in the form of voice messages, computer data, teletype, still pictures, or remotely controlled styli. The system is assumed to be operative 24 hours per day, every day. As required, interconnection can involve any two or more institutions, with each site able to transmit or receive.

As you outline-describe your ideas, please include reference to the following specifics: a) What is the nature of the problem to be dealt with and relieved--what is it that needs to be improved? b) In relieving the problem or making the improvement, who will need to communicate with whom? c) What is the form of the required messages--human voice, teletype, still pictures, numerical data, etc.? d) Would communication be required daily, weekly, monthly, irregularly, or otherwise?

e) Would each communication have a duration of a few minutes, an hour perhaps, or some other duration? INCLUDE ANY SPECIFICS WHICH WILL CLEARLY INDICATE THE PROBLEM AND THE PROPOSED MEANS FOR RELIEVING OR SOLVING IT.

- -

When completed please return promptly to: - -

John Glade
ECS Project
FWA-4
Purdue University
Lafayette, Indiana

APPENDIX H-1

ECS Planning Committee
Info Sheet G
November 1965

EDUCATIONAL COMMUNICATIONS SYSTEM (ECS)

Midwest Model Feasibility Study

Proposal #17

______Department Heads

THE PROBLEM: Heads of _________ Departments have a continuing need to discuss administrative and academic problems with their counterparts. Questions are continually asked regarding professorial workloads, extra-curricular participation, course organization, theoretical developments, student placement, grading procedures, governmental relations, etc. The only opportunity to invite comment or raise questions on these and other problems is presented by Professional Association meetings, visits to other schools, exchange of mimeographed materials, and letters. These methods are not often employed except for very specific questions. Little or no actual discussion takes place because of the inherent barriers in these methods.

THE PROJECT: The creation of a situation in which regular, organized and informal discussion, idea swapping and position-taking by and between heads of ___________ departments can occur is the activity for this project.

THE PROPOSAL: Using ECS facilities, a monthly 1-½ hour audio conference will be scheduled. Using ECS developed formulations to assure participation by all heads and to control participation for maximum understanding, heads will develop an agenda for each meeting. -

TYPICAL AGENDA

1. ROLL CALL: Each head identifies himself upon request of the Chairman, who follows a standard conference call roster - Ohio State University, University of Michigan, Michigan State University, University of Chicago, Northwestern University,

University of Wisconsin, University of Minnesota, University of Iowa, University of Illinois, Purdue University, Indiana University.

2. AGENDA APPROVAL: Chairman reads agenda and asks each for additions and approval as in (1).

3. Presentation of statement on extra-curricular participation of Purdue _______ Department staff.

4. Comments on (3) as in (1).

5. Report on USOE meeting held in Hawaii by University of Michigan head.

6. Comments on (5) as in (1).

7. Another presentation (Wisconsin).

8. Comments.

9. Another Report (Minnesota).

10. Comments.

11. An Idea (Ohio State).

12. Comments.

13. Agenda suggestions for next meeting as in (1).

14. Assignment of agenda topics by Chairman.

15. Sign off as in (1).

APPENDIX I-1

EDUCATIONAL COMMUNICATIONS SYSTEM (ECS)

Midwest Model Feasibility Study
Problem and Action Evaluation Form

Proposal #____ Evaluator______________ University___________
Date____________

Brief Instructions: The accompanying sheet identifies a problem in educational communications and proposes a course of action to relieve the problem. You are asked to read the accompanying sheet, then use the questions below as basis for assessing or appraising both the proposed course of action.

Notice that seven questions below ask you to rate, from "4" to "0" (i.e., high to low) each of the seven aspects of the stated problem and proposed action. Two other questions are "open ended" and ask simply for comments or amendments.

	High				Low
1. Is the problem stated understandably?	4	3	2	1	0
2. To what extent do you feel personally concerned with the stated problem?	4	3	2	1	0
3. Among your campus colleagues, to what extent would the stated problem be a recognized concern?	4	3	2	1	0
4. Are the proposed actions (i.e., the "remedies") understandably stated?	4	3	2	1	0
5. To what extent will the proposed actions resolve the stated problem(s)?	4	3	2	1	0

APPENDIX I-2

	High				Low
6. To what extent would you personally wish to see the proposed actions undertaken?	4	3	2	1	0
7. Among your campus colleagues, to what extent would the proposed actions be supported or encouraged?	4	3	2	1	0

- -

8. Have you any comments on (or amendments to) the statement of the problem? If so, what are they? (Use separate sheet if necessary)

9. Have you any comments on (or amendments to) the statement of proposed actions? If so, what are they? (use separate sheet if necessary)

When completed, please return to: --

John Glade, ECS Project
TV Unit FWA-4
Purdue University
Lafayette, Indiana

Names and Affiliations of Faculty Members Available as Resource Persons for Radio Broadcasting

(Note: Complete professional data on the following people has been compiled. This complete compilation of 100 pages is available for those requiring it.)

Agriculture

University of Illinois
- Harold W. Hannah, LL.B., Professor of Agricultural Law and Veterinary Medical Law.
- Glenn W. Salisbury, Professor of Dairy Science, Head of the Department of Dairy Sciences.

Michigan State University
- George Borgstrom, Professor of Food Science and Geography

University of Minnesota
- Frank H. Kaufert, Professor of Forestry and Director of the Forestry School.
- Richard S. Caldecott, Associate Professor of Agronomy and Plant Genetics.
- Ralph Ernest Comstock, Professor of Genetics and Animal Breeding.
- Sherwood O. Berg, Professor of Agricultural Economics and Dean of the Department of Agriculture.
- Herbert Windal Johnson, Head of Department of Agronomy and Plant Genetics.
- William Ewert Rempel, Associate Professor of Animal Husbandry.
- Leon C. Snyder, Professor of Horticulture and Head of the Department of Horticulture.
- Orrin Clinton Turnquist, Professor of Horticulture.
- William P. Martin, Professor of Soil Science and Head of the Institute of Agriculture at the University.

Ohio State University
- Jean R. Geisman, Associate Professor in the Department of Horticulture and Forestry.
- Dr. Richard W. Redding, Associate Professor in the Department of Veterinary Physiology and Pharmacology.
- Dr. John B. Mitchell, Associate Professor and an extension specialist in Rural Sociology.
- Dr. Ralph J. Woodin, Professor in the Department of Agricultural Education.

Agriculture con't

Ohio State University con't

Dr. Richard L. Rudy, Professor and Chairman of the Department of Veterinary Surgery and Radiology.

Dr. Dorothy D. Scott, Professor and Director of the School of Home Economics.

Dr. Roy M. Kottman, Dean of the College of Agriculture and Home Economics.

Purdue University

Earl L. Butz, Dean of Agriculture

John R. Annis, Professor of Veterinary Science and Medicine.

Harold E. Amstutz, Professor and Head, Department of Veterinary Clinics.

Business and Economics

University of Chicago

Milton Friedman, Professor of Economics.

George J. Stigler, Professor, Department of Economics and Graduate School of Business.

George P. Shultz, Professor and Dean, Graduate School of Business.

University of Illinois

John F. Due, Professor of Economics, Chairman of Department.

Indiana University

L. Leslie Waters, University Professor of Transportation and Business History.

Michigan State University

Walter Adams, Industrial Organization and Public Control, Professor of Economics.

Thomas A. Staudt, Marketing and Transportation, Professor and Chairman of the Department of Marketing and Transportation Administration.

Henry Ogden Barbour, Restaurants-Hotels, Professor and Director of the MSU Schools of Hotel, Restaurant and Institutional Management.

Charles C. Killingsworth, Automation, Labor Economics, Industrial Relations; University Professor of Labor and Industrial Relations.

John Crawford, Advertising, Chairman, Advertising Department, School of Journalism.

Alden C. Olson, Investment Analysis, Associate Professor of Financial Administration.

Business and Economics con't

University of Michigan

- Ross J. Wilhelm, Associate Professor of Business Economics in the Graduate School of Business Administration.
- J. Philip Wernette, Professor of Business Administration.
- Paul W. McCracken, Professor, Graduate School of Business Administration.
- Carl H. Fischer, Professor of Actuarial Mathematics and Professor of Insurance.

University of Minnesota

- Vernon W. Ruttan, Professor of Agricultural Economics.
- George Seltzer, Professor of Economics and Industrial Relations.
- Chester Arthur Williams, Professor of Economics.
- Willard W. Cochrane, Professor of Agricultural Economics.
- John G. Turnbull, Professor of Economics and Industrial Relations and Associate Dean of the Liberal Arts College.
- Walter W. Heller, Professor of Economics and chairman of the Department of Economics.
- Edward Coen, Associate Professor of Economics.

Ohio State University

- Dr. Paul G. Craig, Professor and Chairman of the Department of Economics.
- Dr. Arthur D. Lynn Jr., Associate Dean of Faculties for Program Development in the Office of Academic Affairs; Professor of Economics.
- James R. McCoy, Dean of the College of Commerce and Administration.

Purdue University

- Robert W. Johnson, Professor of Industrial Administration.
- Emanuel T. Weiler, Dean of the School of Industrial Management and Krannert Graduate School of Industrial Administration.

Education

University of Chicago

- Robert J. Havighurst, Professor, Department of Education and Committee on Human Development; Director, Educational Societies Project; and Co-Director, Sociology and Education in Chicago.

Education con't

University of Chicago con't
- Philip W. Jackson, Professor, Department of Education.
- Bruno Bettelheim, Professor, Department of Education, Professor, Departments of Psychology and Psychiatry, and Principal, Sonia Shankman Orthogenic School.
- Joseph J. Schwab, Professor of Natural Sciences (College), and Professor, Department of Education.

University of Illinois
- Harry S. Broudy, Professor of Philosophy of Education.
- Leslie A. Bryan, Director of the Institute of Aviation.
- Samuel A. Kirk, Director of the Institute for Research on Exceptional Children.

Indiana University
- Leo C. Fay, Professor of Elementary Education.

University of Iowa
- E. F. Lindquist, Professor of Education and Director, Iowa Testing Programs.

University of Michigan
- William C. Morse, Professor of Educational Psychology.
- Willard C. Olson, Dean of the School of Education.
- Matthew J. Trippe, Professor of Education, Associate Professor of Special Education and Director of training program for teachers in re-education project.
- Claude Andrew Eggertsen, Professor of Education.
- Phillip S. Jones, Professor of Mathematics, College of Literature, Science and the Arts, and of the Teaching of Mathematics, School of Education.

Northwestern University
- Dr. Paul Witty, Professor of Education

Ohio State University
- Dr. D. Alexander Severino, Associate Dean of the College of Education, campus coordinator of the College's India Project, and a Professor in the School of Art.
- Nathan Lazar, Professor in Department of Education.
- Donald P. Cottrell, Dean of the College of Education.

Purdue University
- Newell C. Kephart, Professor of Education and Psychology; Executive Director of the Achievement Center for Children.

University of Minnesota
- Russell William Burris, Associate Professor of General College and Director of the Center for Study of Programmed Learning.

Education con't

University of Minnesota con't
Roger Edward Wilk, Associate Professor of Educational Psychology.

Engineering

University of Illinois
John Bardeen, Professor of Electrical Engineering and of Physics.
George W. Swenson, Jr., Professor of Electrical Engineering Research Professor of Astronomy.
Nathan M. Newmark, Professor of Civil Engineering; Head of the Department of Civil Engineering.
Ralph B. Peck, Professor of Foundation Engineering.
University of Iowa
Hunter Rouse, Professor of Fluid Mechanics, Dean of Engineering; Director, Institute of Hydraulic Research.
University of Michigan
Hanford W. Farris, Professor and Chairman of the Department of Electrical Engineering.
Wilbur C. Nelson, Chairman of the Department of Aeronautical Engineering.
Fred T. Haddock, Professor of Astronomy and of Electrical Engineering and Director of the University of Michigan Radio Astronomy Observatory.
University of Minnesota
Neal R. Amundson, Professor of Chemical Engineering and Head of the Chemical Engineering Department.
Robert Joseph Collins, Professor of Physics and Head of the Department of Electrical Engineering.
Ralph Rapson, Professor of Architecture and Head of the School of Architecture.
Northwestern University
Dr. Ali B. Gambel, Professor and Chairman of the Mechanical Engineering and Astronomical Science Department.
Ohio State University
Harold A. Bolz, Dean of the College of Engineering and Director of the Engineering Experiment Station.
Rudolph Edse, Professor, Department of Aeronautical and Astronautical Engineering.
Mars G. Fontana, Chairman of the Metallurgical Engineering Department and Professor of Metallurgical Research at the Engineering Experiment Station.

Engineering con't

Ohio State University con't
    Richard H. Zimmerman, Dean of the two-year General College.
Purdue University
    George A. Hawkins, Dean of Engineering

Fine Arts

University of Iowa
    Mauricio Lasansky, Professor of Art
University of Chicago
    Robert M. Adams, Professor, Department of Anthropology; and Director of the Oriental Institute.
    Harold Haydon, Associate Professor Department of Art and College, Director, Midway Studios; Marshal of the University.
Indiana University
    Rudy Pozzatti, Professor of Fine Arts.
University of Michigan
    Robert Iglehart, Professor of Art and Chairman of the Department of Art.
    Marvin Eisenberg, Professor in the Department of the History of Art.
University of Minnesota
    Ralph G. Nichols, Professor of Rhetoric and Head of the Rhetoric Department.
    Herbert Feigl, Professor of Philosophy at the University of Minnesota and Director of the Center for Philosophy Science.
Ohio State University
    Dr. Jerome J. Hausman, Director of the School of Fine and Applied Arts.
Northwestern University
    Dr. Carl Condit, Professor of English, Art and General Studies.
Purdue University
    Ralph G. Beelke, Head, Department of Art & Design.
    Carleton I. Calkin, Professor of Art History.

Law

University of Chicago
    Harry Kalven, Jr., Professor, Law School.
    Philip B. Kurland, Professor, Law School.

Law con't

- University of Chicago con't
  - Norval Morris, Professor and Director, Center for Studies in Criminal Justice.
- Indiana University
  - Ralph F. Fuchs, University Professor of Law.
- University of Michigan
  - Charles W. Joiner, Associate Dean and Professor of Law.
  - Joseph R. Julin, Professor of Law.
- Northwestern University
  - Mr. Fred E. Inbau, Professor of Law.
- University of Minnesota
  - Carl A. Auerbach, Professor of Law.
  - John James Cound, Professor of Law.
- Ohio State University
  - Albert M. Kuhfeld, Associate Dean of The College of Law.
  - Ivan C. Rutledge, Dean-elect of the College of Law.
- University of Wisconsin
  - Nathan P. Feinsinger, Professor of Law.

Literature

- University of Chicago
  - Edward W. Rosenheim, Jr., Professor, Department of English and Humanities.
  - Wayne C. Booth, Dean of the College and George M. Pullman Professor, Department of English.
  - Richard G. Stern, Professor, Department of English and Committee on General Studies Humanities.
  - Saul Bellow, Professor, Committee on Social Thought.
- University of Illinois
  - Harris Francis Fletcher, Professor of English, emeritus.
  - George C. McVittie, Professor of Astronomy, Head of the Department of Astronomy.
  - Robert D. Downs, Dean of Library Administration; Professor of Library Science.
- Indiana University
  - Edwin H. Cady, James H. Rudy Professor of English.
- University of Iowa
  - Paul Engle, Professor of English.
- University of Michigan
  - Donald Hall, Associate Professor.
  - Gerald Frank Else, Professor of Greek and Latin and Chairman of the Department of Classical Studies.
  - Abraham Kaplan, Professor of Philosophy.

Literature con't

University of Minnesota
  Bernard Bowron, Professor of English and Chairman of the American Studies Program.
  Allen Tate, Professor of English.
Northwestern University
  Ernest Samuel, Professor of English.
Ohio State University
  Francis L. Utley, Department of English.
Purdue University
  Arnold Lazarus, Professor of English.

Medical Sciences

University of Chicago
  Leon O. Jacobson, Dean, Division of Biological Sciences; and Joseph Regenstein Professor, Department of Medicine.
  Charles B. Huggins, William B. Ogden Distinguished Service Professor, and Director, Ben May Laboratory for Cancer Research.
University of Illinois
  Warren H. Cole, Professor and Head of the Department of Surgery.
  Harry F. Dowling, Head of the Department of Medicine.
  Mary Kelly Mullane, Dean of the College of Nursing.
Indiana University
  Harris B. Shumacker, Jr., Professor of Surgery and Chairman of the Department of Surgery.
University of Iowa
  John R. Porter, Professor and Head of Microbiology.
  Lewis E. January, Professor of Internal Medicine.
  Donald J. Galagan, Dean of Dentistry.
  Duane C. Spriestersbach, Professor, Speech Pathology and Audiology, and Otolaryngology and Maxillofacial Surgery, and Graduate Dean.
University of Michigan
  George H. Lowrey, Professor in Pediatrics.
  William H. Beierwaltes, Professor of Internal Medicine and of Postgraduate Medicine.
  William Dodd Robinson, Chairman of the Department of Internal Medicine.
  H. Marvin Pollard, Professor Internal Medicine.

Medical Sciences con't

University of Minnesota

John L. McKelvey, Professor of Obstetrics and Gynecology and Head of the Department of Obstetrics and Gynecology.

C. Walton Lillehei, Professor of Surgery.

Cecil James Watson, Professor of Medicine and Head of the Department of Medicine.

Paul E. Meehl, Professor of Clinical Psychology.

Robert A. Good, Professor of Pediatrics.

Frederic James Kottke, Professor of Physical Medicine and Head of the Department of Physical Medicine and Rehabilitation.

Arnold Lazarow, Professor of Anatomy and Head of the Anatomy Department.

John A. Anderson, Professor of Pediatrics.

Abe Bert Baker, Professor of Neurology and Director of Department of Neurology.

Gaylord W. Anderson, Professor of Public Health and Director of the School of Public Health.

Ohio State University

Lloyd M. Parks, Professor and Dean of the College of Pharmacy.

Richard L. Meiling, Dean of the College of Medicine and Director of the University Hospitals.

Harold V. Ellingson, Professor and Chairman of the Department of Preventive Medicine.

Robert M. Zollinger, Chairman of the Department of Surgery.

William G. Myers, Research Professor of Medical Biophysics.

Music

University of Chicago

Leonard B. Meyer, Professor and Chairman, Department of Music; and Director, Contemporary Chamber Players Program.

Ralph Shapey, Assistant Professor, Department of Music, and Director, Contemporary Chamber Players Group.

Howard M. Brown, Associate Professor and Director, Collegium Musicum, Department of Music.

Easley Blackwood, Associate Professor, Department of Music.

APPENDIX J-10

Music con't

- University of Illinois
  - Bernard M. Goodman, Professor of Music.
- Indiana University
  - Dr. Wilfred C. Bain, Dean of the School of Music.
- University of Iowa
  - Charles Treger, Professor of Music.
- University of Michigan
  - Ralph Herbert, Professor of Music.
  - Philip A. Duey, Professor of Voice.
  - Ross Lee Finney, Composer-in-Residence.
  - William D. Revelli, Conductor of Bands.
- Northwestern University
  - Dr. George Howerton, Dean, School of Music.
- Ohio State University
  - Dr. O. Lee Rigsby, Professor and Director of the School of Music.
  - Prof. Louis H. Diercks, Director of the OSU Symphonic Choir.
- Purdue University
  - Prof. Al G. Wright, Head of the Department of Bands.
  - Albert P. Stewart, Director of the Purdue Glee Club.
- University of Wisconsin
  - Gunnar Johansen, Professor of Music.
  - Paul Badura-Skoda, Composer, Conductor.

News/Comment

- University of Chicago
  - Hans J. Morgenthau, Albert A. Michelson Distinguished Service Professor, Departments of Political Science and History; Director, Center for Study of American Foreign and Military Policy.
  - William H. McNeill, Professor and Chairman, Department of History.
  - John Hope Franklin, Professor, Department of History.
  - Richard Wade, Professor, Department of History.
  - Norton S. Ginsburg, Professor, Department of Geography.
  - Martin E. Marty, Professor, Divinity School.
  - Morton A. Kaplan, Professor, Department of Political Science and Professor and Chairman, Committee on International Relations.
  - Harold M. Mayer, Professor, Department of Geography.

News/Comment con't

Indiana University
- Joseph L. Sutton, Dean of the College of Arts and Sciences.

Michigan State
- Dr. Wesley R. Fishel, Professor of Political Science.

University of Minnesota
- William Cecil Rogers, Professor of International Relations and Political Science.

Ohio State University
- William M. Drenten, Assistant Professor, School of Journalism.

Purdue University
- Boyd R. Keenan, Professor of Political Science.
- James E. Dornan, Jr., Assistant Professor of Political Science.

University of Wisconsin
- Norman K. Risjord, Assistant Professor of History.

Science

University of Chicago
- Ray Koppelman, Associate Professor, Department of Biochemistry.
- George W. Beadle, President and Trustee of the University, Professor, Biology, Division of Biological Sciences and College.
- John A. Simpson, Professor, Department of Physics and Enrico Fermi Institute.
- Julian R. Goldsmith, Professor and Chairman, Department of Geophysical Sciences, and Associate Dean, Division of Physical Sciences.
- Richard C. Lewontin, Professor, Department of Zoology.

University of Illinois
- Frederick Seitz, Professor of Physics.
- Max Beberman, Professor of Secondary and Continuing Education.
- Gottbried S. Fraenkel, Professor of Entomology.
- Sol Spiegelman, Professor of Microbiology.
- John C. Bailar, Professor of Inorganic Chemistry.

Indiana University
- Tracy M. Sonneborn, Distinguished Service Professor of Zoology.

Science con't

- University of Iowa
  - James Van Allen, Professor and Head of Physics and Astronomy.
- University of Michigan
  - Dr. James T. Wilson, Director of the Institute of Science and Technology.
  - Prof. Maynard M. Miller, Director Glaciological Institute.
  - Leroy G. Augenstein, Professor and Chairman, Department of Biophysics.
- University of Minnesota
  - Donald B. Lawrence, Professor of Ecology.
  - Victor Elving Anderson, Associate Professor of Zoology.
  - Otto H. Schmitt, Professor of Biophysics and Electronics.
  - Sheldon Clark Reed, Associate Professor of Zoology.
  - Bryce L. Crawford, Professor of Physical Chemistry and Dean of Graduate School.
  - Dean Athelstan F. Spilhaus, Professor of Meteorology and Oceanography and Head of the Institute of Technology.
  - John Robert Borchert, Professor of Geography.
- Northwestern University
  - Dr. Albert Wolfson, Professor of Biology.
  - W. Thomas Lippincott, Vice Chairman of the Chemistry Department.
- Purdue University
  - Richard W. King, Professor of Physics.
  - Fred W. McLafferty, Professor of Chemistry.
- University of Wisconsin
  - Donald H. Bucklin, Professor of Zoology.

Social Science

- University of Chicago
  - Philip M. Hauser, Professor, Department of Sociology.
  - Morris Janowitz, Professor, Department of Sociology.
  - Peter H. Rossi, Professor, Department of Sociology.
- University of Illinois
  - Ralph T. Fisher, Jr., Professor of History; Director of the Center for Russian Language and Area Studies.
  - O. Hobart Mowrer, Professor of Psychology.
  - Charles E. Osgoodm, Professor of Psychology, Director of the Institute of Communications Research.

Social Science con't

- University of Illinois con't
    - Norman A. Graebner, Professor of History.
    - Julian H. Steward, Research Professor of Anthropology.
- Indiana University
    - Alfred R. Lindesmith, Professor of Sociology.
- University of Iowa
    - Sidney E. Mead, Professor of Religion and History.
- University of Michigan
    - Samuel J. Eldersveld, Professor of Political Science.
    - Wilbert J. McKeachie, Professor of Psychology and Chairman of the Department of Psychology.
    - George Katona, Professor of Economics and Psychology and Program Director of the Survey Research Center.
    - Richard L. Cutler, Vice-President for Student Affairs and Professor of Psychology.
    - Rensis Likert, Director of the Institute for Social Research.
    - Angus Campbell, Professor of Psychology and Sociology and Director of Survey Research Center.
- University of Minnesota
    - Harold Charles Deutsch, Professor of History and Chairman of History Department.
    - Clarke A. Chambers, Associate Professor of American History.
    - Robert S. Hoyt, Professor of Medieval History.
    - Tom Bard Jones, Professor of Ancient History.
    - Edmond G. Williamson, Professor of Psychology and Dean of Students.
    - Harold William Stevenson, Professor of Psychology and Director of the Institute for Child Development.
    - E. Adamson Hoebel, Professor of Anthropology.
    - Charles H. McLaughlin, Professor of Political Science and Chairman of the Political Science Department and Director of the Center of International Relations and Area Studies.
    - Benjamine E. Lippincott, Professor of Political Science.
    - David L. Laberge, Associate Professor of Experimental Psychology.
    - Arnold M. Rose, Professor of Social Psychology.
    - John C. Kidneigh, Professor of Social Work and Director of the School of Social Work.

Social Science con't

- University of Minnesota con't
  - Starke R. Hathaway, Professor of Psychology and Clinical Psychology and Director of Division of Clinical Psychology.
- Northwestern University
  - Dr. Scott Greer, Professor of Psychology.
- Ohio State University
  - Morris Weitz, Professor of Philosophy.
  - Dr. Ilsedore M. Edse, Assistant Professor in the Department of German.
  - Dr. Robert A. Oetjen, Professor of Physics and Associate Dean of the College of Arts and Sciences.
  - Dr. J. Osborn Fuller, Dean of the College of Arts and Sciences.
- Purdue University
  - Robert Perloff, Associate Professor of Psychology.
  - William Abbott Owens, Jr., Professor, Department of Psychology and Occupational Research.
- University of Wisconsin
  - Michael B. Petrovich, Professor of History.
  - David Fellman, Professor of Political Science.